



Research and Development in Industry: 1992

Funds, 1992 Scientists & Engineers, January 1993

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Detailed Statistical Tables

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Division of Science Resources Studies Directorate for Social, Behavioral and Economic Sciences



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Raymond M. Wolfe, Project Officer

Division of Science Resources Studies Directorate for Social, Behavioral and Economic Sciences



Suggested Citation

National Science Foundation, Research and Development in Industry, NSF 95-324 (Arlington, VA, 1995).

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Contributors

Data collection, preparation, and tabulations were performed by the Bureau of the Census, Department of Commerce, for the National Science Foundation. The Project Officer for this report was Raymond M. Wolfe.

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GENERAL NOTES

This report provides statistics on research and development (R&D) funding for the years 1982-92 and on R&D personnel for the period from January 1983 to January 1994. The statistics are produced from results of the annual Survey of Industrial Research and Development and provide national estimates of the total expenditures on R&D performed within the United States by industrial firms, whether U.S. or foreign owned. It is a sample survey that intends to include or represent all R&D-performing companies, either publicly or privately held. Every year a survey questionnaire is sent to all companies known, through previous surveys or through outside information sources, to spend more than \$1 million annually on R&D in the United States or to have 1.000 or more employees. Remaining firms are subjected to probability sampling and may or may not receive a questionnaire for a given survey year.

Industry statistics are developed from data collected from individual companies or enterprises. Since the survey is enterprise based rather than establishment based, all data collected for the various subparts of each enterprise (plants, divisions, or subdivisions) are tabulated in the major standard industrial classification (SIC) of the company. The resulting industry estimates are reported using the SIC of the companies within each industry. National totals are estimated by summing the industry estimates.

Several changes have been made to the survey recently that are of special importance to users of this report. Prior to the 1992 survey, statistics were based on samples selected at irregular intervals (i.e., 1967, 1971, 1976, 1981, 1987). In intervening years a subset of the last sample (called a "panel") was used. The most recent sample prior to the 1992 survey was for survey year 1987. Estimates for 1988 through 1991 published in previous reports were based on surveys of approximately 1,700 panel companies that reported R&D activity in the 1987 survey. Beginning with the 1992 survey, statistics are based on samples selected annually. Also, beginning with the 1992 survey, the sample size was increased from approximately 14,000 to nearly 23,400 firms to better account for births of R&D-performing establishments in the

survey universe, to survey more fully and accurately R&D performed by nonmanufacturing firms especially in the service sector and small firms in all industries, and to gather more current information about potential R&D performers. In this report, tables containing historical statistics are presented two ways. For the tables in section A, estimates from the 1992 survey are linked with estimates from the 1987 survey. The linking was accomplished using an algorithm that preserved to the greatest extent possible year-to-year trends for each industry. A full explanation of the linking process is included in section B, under "Comparability of Statistics." Also in section B is a series of tables for which no attempt was made to link the estimates derived from data collected in the 1992 survey to estimates derived from data collected in previous surveys.

The Bureau of the Census, Department of Commerce, has conducted the annual Survey of Industrial Research and Development for the National Science Foundation (NSF) since 1957. Census staff conduct the survey under Title 13 of the United States Code, which prohibits publication or release of data or statistics that may reveal information about individual companies. Therefore, in some tables of this report the symbol "(D)" is used as a footnote reference to indicate that estimates are being withheld to avoid possible disclosure of information about operations of individual companies.

The tables containing statistics developed from the survey data are in section A. Detailed information about the history of the survey, survey methodology, comparability of the statistics, and survey definitions are in the technical notes in section B, and survey questionnaires, instructions, and other survey documents are reproduced in section C. Specific questions regarding the survey may be directed to Raymond Wolfe at (703) 306-1772, via e-mail at rwolfe@nsf.gov (Internet), or at the following mailing address:

Research and Development Statistics Program Division of Science Resources Studies National Science Foundation 4201 Wilson Boulevard, Suite 965 Arlington, VA 22230

Notes

To obtain accurate historical statistics, use only the latest detailed statistical tables in this report and not those published earlier. Statistics in trend tables are derived from the most recently completed survey cycle. Data for prior years are reviewed for consistency with current-year responses and are revised when necessary. Consequently, this report contains the latest revised statistics from the Survey of Industrial Research and Development.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes in section B for more information.

SECTION A. DETAILED STATISTICAL TABLES

TABLE NOTES

Classification of reporting units

The basic reporting unit is the company or enterprise that includes all establishments under common ownership or control. All research and development (R&D) expenditures and all scientists and engineers of each company are classified into a single standard industrial classification (SIC) and size category.

Company Size-Class

Companies are categorized by their total number of domestic employees. The following are the six company size-classes used in this report:

- 1. Fewer than 500 employees;
- 2. 500 to 999 employees;
- 3. 1,000 to 4,999 employees;
- 4. 5,000 to 9,999 employees;
- 5. 10,000 to 24,999 employees;
- 6. 25,000 or more employees.

Current and Constant Dollars

Statistics in all tables are reported in terms of current dollars. Constant dollars are also presented in two summary trend tables, tables A-1 and A-22.

Geographic Statistics

The statistics cover only those operations located in the 50 States and the District of Columbia. Companysponsored R&D performed outside the United States by foreign subsidiaries of U.S. domestic companies is included in table A-9 but is excluded from all other tables.

Industry Classification

An enterprise or company level SIC code was assigned to each company. A single SIC code was assigned to multiestablishment companies based on the code that represented the most dominant aggregated activity for that firm in terms of total payroll. Statistics for the following industry groupings are published in this report (SIC code(s) are shown in parentheses¹):

Food, kindred, and tobacco products (20,21)²

Textiles and apparel (22,23)

Lumber, wood products, and furniture (24,25)

Paper and allied products (26)

Chemicals and allied products (28)

Industrial chemicals (281-82,286)

Drugs and medicines (283)

Other chemicals (284-85.287-89)

Petroleum refining and extraction (13,29)

Rubber products (30)

Stone, clay, and glass products (32)

Primary metals (33)

Ferrous metals and products (331-32,3398-99)

Nonferrous metals and products (333-36)

Fabricated metal products (34)

Machinery (35)

Office, computing, and accounting machines (357)

Other machinery, except electrical (351-56,358-59)

Electrical equipment (36)

Radio and TV receiving equipment (365)

Communication equipment (366)

Electronic components (367)

Other electrical equipment (361-64,369)

Transportation equipment (37)

Motor vehicles and motor vehicles equipment (371)

Other transportation equipment (373-75,379)

Aircraft and missiles (372,376)³

Professional and scientific instruments (38)

Scientific and mechanical measuring instruments (381-82)

Optical, surgical, photographic, and other instruments (384-87)

Other manufacturing industries—printing and publishing (27), leather products (31), and miscellaneous manufacturing industries (39)

¹ When the 1992 sample was drawn, the 1987 revision of the standard industrial classification (SIC) system was in effect.

² Until 1984, the tobacco products industry (SIC 21) was included with "other manufacturing industries."

³ Because of the close similarity of their R&D activities, companies primarily engaged in the manufacture of ordnance and accessories, including complete guided missiles, are grouped with companies primarily engaged in the manufacture of aircraft and parts.

Nonmanufacturing industries-agricultural services, forestry, fishing and hunting (07-09); mining (10, 12-14); construction (15-17); transportation, communications, electric, gas, and sanitary services (40-42,44-49); wholesale and retail trade (50-59); finance, insurance, and real estate (60-65); holding and other investment offices (67); hotels and motels (701); business services (73); automotive repair, services, and parking and miscellaneous repair services (75-76); motion pictures and amusement and recreation services (78-79); health and legal services (80-81); social services (83); museums, art galleries, botanical and zoological gardens (84); engineering, accounting, research, management, and related services (87); and miscellaneous services (89).

Percentages

Percentages were calculated on the basis of thousands of dollars and may differ from those calculated using the rounded figures shown.

Rounding

Because of rounding, detail may not add to totals.

Suppression of Statistics

The Bureau of the Census conducts the survey under Title 13 of the United States Code, which prohibits

publication or release of data or statistics that may reveal information about individual companies. Also, missing data are imputed for some data items. Therefore, the data in some of the table cells may have been deleted and replaced with one of the following notations:

"(D)," which indicates that statistics are being withheld to avoid possible disclosure of information about operations of individual companies. This occurs when a small number of companies account for a large percentage of the R&D funds or of scientists and engineers in a particular data cell. The tables most often affected by this rule are those that contain data on Federal support to companies for R&D performance.

"(S)," which indicates that the imputation rate—the percentage of the statistic not reported by respondents and consequently estimated—exceeds 50 percent for that item. See table B-3 in section B for imputation rates for specific items.

Although publication of certain cells may be withheld, the estimates in the cells are always included in totals. In some instances, cells withheld because of high imputation rates (notation "(S)") can be derived by subtraction from higher level totals. In such cases the user should be aware that the derived numbers are statistically unreliable. In no instance can cells be derived that would disclose operations of individual companies (notation "(D)").

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This is a comprehensive list of all tables in this publication. The list includes the detailed statistical tables in section A and the technical tables in section B.

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| | Total R | &D | Fede | ral | Compar | ny 1/ |
| Year | Current dollars | Constant 1987 dollars | Current dollars | Constant 1987 dollars | Current dollars | Constant 1987 dollars |
| 1953 | \$3,630 | 16,500 | \$1,430 | 6,500 | \$2,200 | 10,000 |
| 1954 | 4,070 | 18,333 | 1,750 | 7,883 | 2,320 | 10,450 |
| 1955 | 4,640 | 20,262 | 2,180 | 9,520 | 2,460 | 10,742 |
| | 6,605 | 27,987 | 3,328 | 14,102 | 3,277 | 13,886 |
| | 7,731 | 31,684 | 4,335 | 17,766 | 3,396 | 13,918 |
| | 8,389 | 33,691 | 4,759 | 19,112 | 3,630 | 14,578 |
| | 9,618 | 37,570 | 5,635 | 22,012 | 3,983 | 15,559 |
| 1960 | 10,509 | 40,419 | 6,081 | 23,388 | 4,428 | 17,031 |
| | 10,908 | 41,475 | 6,240 | 23,726 | 4,668 | 17,749 |
| | 11,464 | 42,617 | 6,434 | 23,918 | 5,029 | 18,695 |
| | 12,630 | 46,434 | 7,270 | 26,728 | 5,360 | 19,706 |
| | 13,512 | 48,780 | 7,720 | 27,870 | 5,792 | 20,910 |
| 1965 | 14,185 | 49,947 | 7,740 | 27,254 | 6,445 | 22,694 |
| | 15,548 | 52,884 | 8,332 | 28,340 | 7,216 | 24,544 |
| | 16,385 | 54,076 | 8,365 | 27,607 | 8,020 | 26,469 |
| | 17,429 | 54,808 | 8,560 | 26,918 | 8,869 | 27,890 |
| | 18,308 | 54,814 | 8,451 | 25,302 | 9,857 | 29,512 |
| 1970 | 18,067 | 51,327 | 7,779 | 22,099 | 10,288 | 29,227 |
| | 18,320 | 49,380 | 7,666 | 20,663 | 10,654 | 28,717 |
| | 19,552 | 50,392 | 8,017 | 20,662 | 11,535 | 29,729 |
| | 21,249 | 51,450 | 8,145 | 19,722 | 13,104 | 31,729 |
| | 22,887 | 50,973 | 8,220 | 18,307 | 14,667 | 32,666 |
| 1975 | 24,187 | 49,161 | 8,605 | 17,490 | 15,582 | 31,671 |
| | 26,997 | 51,620 | 9,561 | 18,281 | 17,436 | 33,338 |
| | 29,825 | 53,354 | 10,485 | 18,757 | 19,340 | 34,597 |
| | 33,304 | 55,231 | 11,189 | 18,556 | 22,115 | 36,675 |
| | 38,226 | 58,271 | 12,518 | 19,082 | 25,708 | 39,189 |
| 1980 | 44,505 | 62,071 | 14,029 | 19,566 | 30,476 | 42,505 |
| | 51,810 | 65,665 | 16,382 | 20,763 | 35,428 | 44,902 |
| | 58,650 | 69,988 | 18,545 | 22,130 | 40,105 | 47,858 |
| | 65,268 | 74,849 | 20,680 | 23,716 | 44,588 | 51,133 |
| | 74,800 | 82,198 | 23,396 | 25,710 | 51,404 | 56,488 |
| 1985 | 84,239 | 89,236 | 27,196 | 28,809 | 57,043 | 60,427 |
| | 87,823 | 90,633 | 27,891 | 28,783 | 59,932 | 61,849 |
| | 92,155 | 92,155 | 30,752 | 30,752 | 61,403 | 61,403 |
| | 97,015 | 93,373 | 30,343 | 29,204 | 66,672 | 64,169 |
| | 102,055 | 94,060 | 28,554 | 26,317 | 73,501 | 67,743 |
| 1990 | 109,727 | 96,846 | 28,125 | 24,823 | 81,602 | 72,023 |
| | 116,952 | 99,449 | 26,372 | 22,425 | 90,580 | 77,024 |
| | 121,314 | 100,342 | 24,660 | 20,397 | 96,654 | 79,945 |
| | 122,000 | 98,785 | 24,000 | 19,433 | 98,000 | 79,352 |
| | 123,800 | 98,176 | 24,000 | 19,033 | 99,800 | 79,144 |

^{1/} Company funds include funds for industrial R&D work performed within company facilities from all sources except the Federal Government. The funds may be the companies' own or from outside organizations such as research institutions, universities and colleges, nonprofit organizations, other companies, and state governments. Company-financed R&D not performed within the company is excluded.

N/A Not available

NOTE: 1987 gross domestic product implicit price deflators were used to convert current dollars to constant dollars. As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

Table A-2. Selected data for R&D-performing companies, by industry: 1991-92

| | | | Res | esearch and development funds | relopment fund | şp | | Domestic net sales | stic | R&D s & en | R&D scientists & engineers | eml | Domestic employment |
|--|--|-------------------------------------|--|--|--|---|---|---|--|---------------------------------|---------------------------------|---------------------------------------|---------------------------------------|
| 16 yeshingi | C C | | | | | | | | | | [in thousands] | ands] | |
| / Ansangii | appo olo | Total | | Federal | ral | Company | any | | | January | ry 2/ | March | r, |
| | | 1991 | 1992 | 1991 | 1992 | 1991 | 1992 | 1991 | 1992 | 1992 | 1993 | 1991 | 1992 |
| | | | | | [Dollars in millions] | millions] | | | | | | | |
| Total | | \$116,952 | \$121,314 | \$26,372 | \$24,660 | \$90,580 | \$96,654 | \$2,939,040 | \$3,063,469 | 779.3 | 787.1 | 16,963 | 16,632 |
| Food and kindred products | 20 21 22 | 1,244 33 (D) | 1,371 40 (D) | 0 0 0 | 000 | 1,244 33 180 | 1,371 | 249,411 4,922 31,189 | 258,484 (S) 34,378 | 9.6 | 9.6 (S) 2.2 | 1,007 16 325 | 1,008 15 328 |
| Apparel | 23 | (D) 40 | <u>(a)</u> (b) | (g) ° | <u> </u> | 56 | (D) | 7,852 | 8,688 | 0.8 | 0.9 | 83 | 83 60 |
| Furniture and fixtures | 25 26 | <u>Q</u> Q | <u>©</u> <u>©</u> | 99 | <u>@</u> @ | 160 | 168 | 16,976 | 18,035 | 1.2 | 1.4 | 211 | 213 571 |
| Printing, publishing, and allied industries. Chemicals and allied products | 27 28 13,29 | (D) 14,648 2,498 | 290 16,711 2,339 | 67 209 11 | <u>(a)</u> (8) | (D) 14,439 2,487 | (D) 16,420 2,330 | 31,478 271,027 241,341 | 27,862 279,595 237,516 | 2.5 85.6 11.5 | 2.5 89.2 11.5 | 1,203 | 271 1,150 406 |
| Rubber products | 3 3 3 3 3 3 8 | (D) (D) 714 974 | (D) (D) (D) 555 1,057 | (D) 0 (D) 8 226 | (C) (D) (D) (D) (D) (D) (D) (D) (D) (D) (D | (D) (D) 455 706 748 | 1,337 (D) 479 542 542 | 49,739 2,986 27,741 87,303 63,205 | 52,926 3,562 28,815 88,877 68,185 | 4.8 6.0 6.3 7.3 7.8 | 0.4 0.0 0.0 0.4 0.8 | 388 29 234 451 486 | 393 32 232 447 500 |
| Machinery | 35 37 38 39 39 39 | 14,775 13,415 27,428 8,705 | 15,135 13,546 26,484 9,652 (D) | 1,055 4,550 12,570 1,865 (D) | 1,062 3,857 10,738 2,226 (D) | 13,720 8,865 14,858 6,840 (D) | 14,073 9,689 15,726 7,426 322 | 182,426 207,759 370,104 95,962 28,367 | 193,697 236,605 380,434 102,522 29,565 | 99.3 91.9 141.1 (S) | 99.4 90.5 144.7 (S) | 1,417 1,393 1,996 895 106 | 1,347 1,382 1,902 879 108 |
| Communication services | 48,part 737 | <u>(a)</u> | <u>(a)(a)</u> | <u>(Q)(Q)</u> | <u> </u> | 4,206 | 4,131 | 181,979 168,297 | 188,215 172,088 | 34.0 | 33.1 | 1,040 | 1,002 556 |
| other computer-related engineering, architectural, and surveying services | part 737,871 | 5,769 | 6,663 | 2,528 | 2,774 | 3,241 | 3,889 | 46,042 | 48,996 | 52.9 | 0.09 | 395 | 367 |
| laboratories | 806-07 | 549 | 615 | 145 | 191 | 404 | 424 | 15,604 | 17,591 | 4.4 | 4.6 | 283 | 294 |
| Assertor, development, and and testing services | 873 07-10, 12-17, 40-42, 44-49, | 9,302 | 9,667 | 1,313 | 1,381 | 7,989 | 8,286 | 12,927 428,336 | 14,068 446,619 | 52.4 | 54.6 56.9 | 170 | 164 2,922 |
| | 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 | - | | | | | | | | | | | |

^{1/} Industries, industry groups, and product fields shown separately are classified according to the 1987 Standard Industrial Classification (SIC) manual codes. 2/ Data recorded in January represent employment figures for the previous year.

 ⁽D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-3. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1982-92

[Dollars in millions]

| | 7 | | Dolla | [Dollars III millions] | | | | | | | a. ; | Page 1 of 2 |
|--|-------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------------------|------------------------------------|------------------------------------|---------------------------------|--------------------------------------|--------------------------------------|
| Industry and size of company | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| Total | | \$58,650 | \$65,268 | \$74,800 | \$84,239 | \$87,823 | \$92,155 | \$97,015 | \$102,055 | \$109,727 | \$116,952 | \$121,314 |
| Food, kindred, and tobacco products 1/ | 20,21 22,23 24,25 26 26 | (D) (D) 159 566 6,604 | (D) (D) 152 (D) 7,185 | (D) (D) 143 (D) 7,927 | (D) (D) 147 (D) 8,540 | (D) (D) 144 (D) 8,843 | 1,206 (D) 137 (D) 9,635 | (D) (D) (D) (D) 11,067 | (D) (D) (D) (D) 12,069 | (D) (D) (D) (D) (D) | 1,277 (D) (D) (D) 14,648 | 1,411 277 (D) (D) 16,711 |
| Industrial chemicals Drugs and medicines Other chemicals | 281-82,286 283 284-85,287-89 | 3,206 (D) (D) | 3,214 (D) (D) | 3,240 (D) (D) | 3,498 (D) (D) | 3,552 3,658 1,633 | 3,716 (D) (D) | 4,172 (D) (D) | 4,451 (D) (D) | 5,010 (D) (D) | 5,390 (D) (D) | 5,406 8,831 2,474 |
| Petroleum refining and extraction | 13,29 30 32 33 33 | (D) (D) 987 | (D) 1,085 | 0000 | 0000 | (D) 950 (D) | 1,897 (D) 995 730 | 1,997 (D) (D) 637 | 2,180 (D) (D) 686 | 2,306 (D) (D) 739 | 2,498 (D) (D) 714 | 2,339 (D) (D) 555 |
| Ferrous metals and products | 331-32,3398-99 333-36 | 00 | 00 | (D) 336 | (D) 416 | (D) 458 | 00 | 00 | (a) | <u>(a)</u> | 00 | <u>(a)</u> |
| Fabricated metal products | 34 | 625 8,078 | 701 | 842 10,504 | 829 12,216 | 895 (D) | 783 (D) | 881 (D) | 904 (D) | 939 14,446 | 974 14,775 | 1,057 15,135 |
| Office, computing, and accounting machines | 357 351-56,358-59 | 00 | <u>0</u> 0 | <u>©</u> <u>©</u> | <u>ê</u> ê | (D) 2,396 | (D) 2,428 | 00 | <u>(a)</u> (a) | <u>(a)</u> | <u>(a)</u> (a) | <u>(a)</u> |
| Electrical equipment | 36 | 10,923 | 12,681 | 13,778 | 14,432 | 14,980 | 15,848 | 14,128 | 13,318 | 13,400 | 13,415 | 13,546 |
| Radio and TV receiving equipment | 365 366 367 367 | (D) 5,839 1,740 (D) | (D) 7,298 2,169 (D) | (D) 8,685 2,831 (D) | (D) 9,397 3,385 (D) | 133 9,669 (D) (D) | 139 10,184 4,286 1,239 | (D) 8,427 (D) (D) | (D) 7,071 (D) | (D) 5,928 (D) (D) | (D) 4,787 (D) (D) | (D) 3,678 (D) |
| Transportation equipment | 37 | (D) | (Q) | (D) | (D) | 31,275 | 34,246 | 34,775 | 33,859 | 31,361 | 27,428 | 26,484 |
| Motor vehicles and motor vehicles equipment Other transportation equipment | 373-75,379 372,376 | 4,797 (D) 14,451 | 5,318 (D) 15,406 | 6,057 (D) 18,858 | 6,984 (D) 22,231 | (D) (D) 21,050 | (D) (D) 24,458 | (D) (D) 24,168 | (D) (D) 22,331 | (D) (D) 20,635 | (D) (D) 16,629 | (D) (D) 16,119 |
| | | | | | | | | | | | | |

See explanatory information and SOURCE at end of table.

Table A-3. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1982-92

[Dollars in millions]

| | | | | | - | | | | | | а. | Page 2 of 2 |
|---|--|--------------|--------------|--------------|--------------|----------|--------------|---------------|---------------|---------------|---------------|---------------|
| Industry and size of company | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| Distribution by industry: | | | | | | | | | | | | |
| Professional and scientific instruments | 38 | \$3,930 | \$4,266 | \$4,602 | \$5,013 | \$5,103 | \$5,222 | \$5,530 | \$5,992 | \$7,055 | \$8,705 | \$9,652 |
| Scientific and mechanical measuring instruments | 381-82 | (D) | (D) | (D) | (<u>D</u>) | (Q) | (D) | (<u>Q</u>) | (D) | <u>(</u>) | (D) | 5,256 |
| Optical, sulgical, procediapriic, and oried instruments | 384-87 | (D) | (D) | (D) | (D) | (D) | (D) | (D) | (D) | (D) | (D) | 4,396 |
| Other manufacturing industries 1/ | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, | (D) 2,472 | (D) 3,337 | (D) 4,905 | (D) 6,714 | 382 | (D) 7,844 | (D) 10,513 | (D) 14,031 | (D) 20,793 | (D) 28,446 | (D) 30,103 |
| Distribution by size of company: [Based on number of employees] | 79-79, 00-01, 83-84, 87, 89 | | | | | | | | | | | |
| Total | | \$58,650 | \$65,268 | \$74,800 | \$84,239 | \$87,823 | \$92,155 | \$97,015 | \$102,055 | \$109,727 | \$116,952 | \$121,314 |
| Fewer than 500 2/ | | 2,934 N/A | 4,422 N/A | 4,402 | 5,866 | 7,071 | 7,163 | (S) 1,669 | 7,809 | (S) | 13,172 | 14,496 |
| 1,000 to 4,999 | | 3,864 | 4,178 | 5,520 | 6,240 | 7,472 | 7,262 | 7,622 | 7,881 | 8,411 | 10,453 | 12,415 |
| 10,000 to 24,999 | | | | _ | 11,109 | 10,493 | 12,043 | 11,506 | 10,450 | 12,486 | 15,770 | 16,419 |
| 25,000 or more | | | 44,372 | 48,837 | 55,354 | 56,991 | 59,461 | 63,694 | 68,334 | 71,030 | 61,508 | 60,902 |
| | | | | | | | | | | | | |

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries." 2/ Data for 1982-83 are for companies with fewer than 1,000 employees. 3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

(D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 N/A = Not available

KEY:

industries and small firms in all industries. See the technical notes for more information. NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics better reflect R&D performance among firms in the nonmanufacturing

Table A-4. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1992

| | | | | | Size of | Size of company | | Page 1 of 2 |
|---|-------------------------------------|--------------------------------------|---|----------------------------|---------------------------------|--------------------------------|----------------------------------|--------------------------------|
| Industry | SIC code | Total | Fewer than 500 employees | 500 to 999 employees | 1,000 to 4,999 employees | 5,000 to 9,999 employees | 10,000 to 24,999 employees | 25,000 or more employees |
| | | | | [Dollar | [Dollars in millions] | | | |
| Total | | \$121,314 | \$14,496 | \$8,410 | \$12,415 | \$8,672 | \$16,419 | \$60,902 |
| Food, kindred, and tobacco products Textiles and apparel Lumber, wood products, and furniture Paper and allied products Chemicals and allied products | 20,21 22,23 24,25 26 26 | 1,411 277 (D) (D) 16,711 | (D) | 39 11 26 (D) | 158 136 54 59 2,799 | 184 (D) 39 43 (D) | 44 (0) (0) (0) (0) | 84 (0) (0) (0) (0) |
| Industrial chemicals | 281-82,286 283 284-85,287-89 | 5,406 8,831 2,474 | 157 (D) 277 | 000 | 536 (D) (D) | 000 | 1,911 4,218 (D) | 000 |
| Petroleum refining and extraction | 13,29 30 32 33 | 2,339 (D) (D) 555 | (D) (D) (D) | 2 136 15 21 | (D) (S) 39 130 | (S) (D) (D) | (D) 90 364 118 | 1,777,1 (D) (D) (D) |
| Ferrous metals and products | 331-32,3398-99 333-36 | (a) (a) | 21 | (a) (a) | 48 | (a) (a) | 49 69 | (D) |
| Fabricated metal products | 34 | 1,057 15,135 | 258 1,279 | 42 503 | (D) 1,685 | (D) 2,198 | 99 | 0 (D) |
| Office, computing, and accounting machines | 357 351-56,358-59 | <u>(a)</u> | (Q) (Q) | 288 215 | <u>©</u> <u>©</u> | <u>0</u> 0 | 00 | (Q) (Q) |
| Electrical equipment | 36 | 13,546 | 1,733 | (Q) | <u>(a)</u> | (D) | (D) | 7,131 |
| Radio and TV receiving equipment | 365 366 367 361-64,369 | (D) (C) 3,678 (D) | 19 470 893 351 | 0000 | 0000 | 0 0 (D) 138 | <u> </u> | 0 3,210 (D) (D) |
| Transportation equipment | 37 | 26,484 | 34 | (Q) | (a) | (D) | 2,605 | 23,136 |
| Motor vehicles and motor vehicles equipment | 373-75,379 372,376 | (D) (D) 16,119 | 3 9 22 | 000 | 59 (D) 147 | (D) (D) 133 | 000 | (D) (D) 13,339 |

See explanatory information and SOURCE at end of table.

Table A-4. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1992

| Page 2 of 2 | | 25,000 or more employees | | \$5,679 | (D) | (D) | <u>(a)</u> (a) |
|-------------|-----------------|----------------------------------|-----------------------|---|---|--|--|
| Pag | | | | <u> </u> | <u> </u> | 6 | |
| | | 10,000 to 24,999 employees | | (D) | (D) | (D) | <u> </u> |
| | Size of company | 5,000 to 9,999 employees | | (a) | (a) | 360 | 2,282 |
| | Size of | 1,000 to 4,999 employees | [Dollars in millions] | \$1,284 | (a) | (D) | 3,199 |
| | | 500 to 999 employees | [Dollars | (D) | (D) | (D) | 6,105 |
| | | Fewer than 500 employees | | \$1,157 | 613 | 544 | 210 |
| | | Total | | \$9,652 | 5,256 | 4,396 | 30,103 |
| | | SIC code | | 38 | 381-82 | 384-87 | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 |
| | | Industry | | Professional and scientific instruments | Scientific and mechanical measuring instruments | optical, su gical, protographic, and other instruments | Other manufacturing industries |

(D) = Data have been withheld to avoid disclosing operations of individual companies. (S) = Data have been withheld because of imputation of more than 50 percent. KEY:

Table A-5. Total (company, Federal, and other) funds for industrial R&D performance, by industry, size of company, and size of R&D program: 1992

| | | | | Size | of R&D progra | m | |
|--|--|--|-------------------------------------|-------------------------------------|---|--|---|
| Industry and size of company | SIC code | Total | Less than \$200,000 | \$200,000 to \$999,999 | \$1 million to \$9.999 million | \$10 million to \$99.999 million | \$100 million or more |
| | | | | [Dollars in | millions] | | |
| Total | | \$121,314 | \$1,064 | \$4,507 | \$9,666 | \$25,107 | \$80,970 |
| Distribution by industry: | | \$121,014 | Ψ1,004 | Ψ+,007 | ψο,σσσ | Ψ23,107 | φου,στο |
| Food, kindred, and tobacco products | 20,21 22,23 24,25 26 28 | 1,411 277 (D) (D) 16,711 | (D) 7 (D) (D) 55 | 37 28 42 12 362 | 202 116 51 144 560 | 571 126 112 401 2,495 | (D) C (D) 13,239 |
| Industrial chemicals | 281-82,286 283 284-85,287-89 | 5,406 8,831 2,474 | 16 3 36 | 10 219 133 | 185 132 243 | 1,118 683 694 | 4,077 7,794 1,368 |
| Petroleum refining and extraction | 13,29 30 32 33 | 2,339 (D) (D) 555 | 7 (D) (D) 10 | 12 35 24 37 | 77 443 50 148 | 574 339 277 360 | 1,669 479 (D) |
| Ferrous metals and products Nonferrous metals and products | 331-32,3398-99 333-36 | (D) (D) | (D) (D) | (D) (D) | 69 79 | 135 224 | 0 |
| Fabricated metal products | 34 35 | 1,057 15,135 | (D) 91 | 115 497 | 335 1,056 | 397 2,020 | (D) 11,471 |
| Office, computing, and accounting machines Other machinery, except electrical | 357 351-56,358-59 | (D) (D) | (D) (D) | (D) (D) | 240 816 | 896 1,124 | 10,389 1,082 |
| Electrical equipment | 36 | 13,546 | 94 | 416 | 1,340 | 2,685 | 9,011 |
| Radio and TV receiving equipment | 365 366 367 361-64,369 | (D) (D) 3,678 (D) | (D) (D) 43 (D) | (D) (D) 183 151 | 24 383 615 318 | (D) 607 (D) 786 | 0 3,912 (D) (D) |
| Transportation equipment | 37 | 26,484 | 5 | 37 | 207 | 701 | 25,535 |
| Motor vehicles and motor vehicles equipment Other transportation equipment Aircraft and missiles | 371 373-75,379 372,376 | (D) (D) 16,119 | 1 2 2 | 6 7 24 | 128 39 40 | (D) (D) 315 | (D) (D) 15,738 |
| Professional and scientific instruments | 38 | \$9,652 | \$59 | \$427 | \$890 | \$1,942 | \$6,334 |
| Scientific and mechanical measuring instruments Optical, surgical, photographic, and other | 381-82 | 5,256 | 43 | 141 | 508 | 1,167 | 3,397 |
| instruments | 384-87 | 4,396 | 16 | 286 | 382 | 7 75 | 2,937 |
| Other manufacturing industriesNonmanufacturing industries | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 | (D) 30,103 | (D) 557 | 44 2,380 | 245 3,804 | 333 11,774 | (D) 11,588 |
| Distribution by size of company [Based on number of employees] | 35 5 1, 57, 55 | | | | | | |
| Total | | \$121,314 | \$1,064 | \$4,507 | \$9,666 | \$25,107 | \$80,970 |
| Fewer than 500. 500 to 999 | | 14,510 8,410 12,413 8,673 16,418 60,890 | 1,030 (D) 13 1 0 (D) | 4,231 124 122 21 7 2 | 6,145 893 2,039 369 171 49 | 3,104 7,104 7,110 2,759 3,056 1,974 | 0 (D) 3,129 5,523 13,184 (D) |

 ⁽D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.

Table A-6. Number of R&D-performing companies, by industry, size of company, and size of R&D program: 1992

Page 1 of 1

| | | | | | | | Page 1 of 1 |
|--|--------------------------|---|--|--|---|---|-----------------------------------|
| | | | | Size | of R&D progr | am | |
| Industry and size of company | SIC code | Total | Less than \$200,000 | \$200,000 to \$999,999 | \$1 million to \$9.999 million | \$10 million to \$99.999 million | \$100 million or more |
| Total | | 36,155 | 22,392 | 9,280 | 3,510 | 828 | 145 |
| Food, kindred, and tobacco products Textiles and apparel Lumber, wood products, and furniture. Paper and allied products Chemicals and allied products | 22,23 24,25 | 1,273 180 426 154 2,079 | 1130 72 296 60 1,206 | 70 62 104 20 611 | 49 39 20 60 156 | (D) 7 6 (D) 71 | (D) 0 0 (D) 35 |
| Industrial chemicals | 283 | 708 4 09 962 | 602 56 548 | 19 291 301 | 47 25 84 | (D) 18 (D) | (D) 19 (D) |
| Petroleum refining and extraction Rubber products Stone, clay, and glass products Primary metals | 30 32 | 234 1,828 364 323 | 157 1,564 254 165 | 29 73 78 95 | 26 176 21 49 | 16 15 (D) 14 | 6 0 (D) |
| Ferrous metals and products Nonferrous metals and products | 331-32,3398-99 333-36 | 120 203 | 43 122 | 51 44 | 20 29 | 6 8 | 0 |
| Fabricated metal products | | 735 4,889 | 348 2,795 | 222 1,679 | 149 315 | (D) 78 | (D) 22 |
| Office, computing, and accounting machines Other machinery, except electrical | | 970 3,919 | 536 2,259 | 264 1,415 | 109 206 | (D) (D) | (D) (D) |
| Electrical equipment | 36 | 3,030 | 1,515 | 914 | 486 | 100 | 15 |
| Radio and TV receiving equipment Communication equipment Electronic components Other electrical equipment | 366 367 | 159 477 1,485 909 | 138 143 775 459 | 13 168 413 320 | (D) (D) 245 100 | (D) (D) 46 (D) | 0 (D) 6 (D) |
| Transportation equipment | 37 | 538 | 345 | 73 | 65 | 32 | 23 |
| Motor vehicles and motor vehicles equipment Other transportation equipment Aircraft and missiles | | 64 84 390 | 9 56 280 | 11 14 48 | 31 11 23 | (D) (D) 20 | (D) (D) 19 |
| Professional and scientific instruments | 38 | 2,450 | 1,132 | 921 | 309 | 76 | 12 |
| Scientific and mechanical measuring instruments | 381-82 | 1,307 | 744 | 349 | 169 | 39 | 6 |
| Optical, surgical, photographic, and other instruments | 384-87 | 1,143 | 388 | 572 | 140 | 37 | 6 |
| Other manufacturing industries | | 1,157 16,492 | 947 10,406 | 94 4,235 | 107 1,483 | 9 346 | 0 22 |
| Distribution by size of company [Based on number of employees] | | | | | | | |
| Total | | 36,155 | 22,392 | 9,280 | 3,510 | 828 | 145 |
| Fewer than 500 | | 33,529 883 1,171 260 191 121 | 22,057 (D) 140 10 8 (D) | 8,740 250 (D) 39 13 (D) | 2,551 294 525 81 44 15 | 181 162 248 102 88 47 | 0 (D) (D) 28 38 53 |

Table A-7. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1982-92

| Total Tota | | | | | | | | | | | | | Page 1 of 2 |
|--|--|--------------------------|------------|--------------|--------------|--------------|--------------|-----------------|---------------|--------------|--------------|--------------|-------------|
| Total Distribution by industry. Food kindred, and tobacco products: 1202 2021 7777 824 1081 1138 1128 1128 1129 121 124 124 124 124 124 124 124 124 124 | Industry and size of company | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| Destribution by inclasity: | | | | | | | [Dol] | lars in million | [SL | | | | |
| Food, kindrad, and tobacco products 1 20.21 777 624 1,081 1,136 1,206 1,173 1,174 1,173 1,244 1,278 1,278 Peadle and products. 2,425 1,99 150 150 1,174 144 137 1,174 1,248 1,277 Peagle and products. 2,425 1,99 1,90 5,22 1,174 1,174 1,174 1,174 1,174 1,248 1,277 1,174 1,17 | Total | | \$40,105 | \$44,588 | \$51,404 | \$57,043 | \$59,932 | \$61,403 | \$66,672 | \$73,501 | \$81,602 | \$90,580 | \$96,654 |
| Food winding and tobaccoop products. 20.21 777 82.0 1,136 1,136 1,136 1,136 1,136 1,136 1,136 1,136 1,136 1,136 1,136 1,136 1,136 1,137 1,134 1,248 1,278 Lumbay and alled products. 24,25 1,59 1,59 2,50 | Distribution by industry: | | | | | | | _ | | | | - | |
| 28.23 136 150 1482 278 246 243 156 162 278 278 248 243 166 169 216 220 220 220 252 564 576 538 604 772 173 173 173 173 174 144< | Food, kindred, and tobacco products 1/ | 20,21 | 777 | 824 | 1,081 | 1,136 | 1,280 | 1,204 | 1,173 | 1,244 | 1,248 | 1,277 | 1,411 |
| Pages and lised productis. 26 56.50 59.40 57.50 6.37 6.44 7.22 6.44 7.22 6.44 7.22 6.44 7.22 6.44 6.40 7.22 6.44 6.40 7.22 6.44 6.40 7.22 6.44 6.40 7.22 6.44 6.40 7.22 6.44 6.40 7.22 6.44 <t< td=""><td></td><td>22,23</td><td>136</td><td>150</td><td>182</td><td>218</td><td>246</td><td>243</td><td>215</td><td>(S) 192</td><td>260</td><td>236</td><td>259 (D)</td></t<> | | 22,23 | 136 | 150 | 182 | 218 | 246 | 243 | 215 | (S) 192 | 260 | 236 | 259 (D) |
| Industrial chemicals | Paper and allied products | 26 28 | 566 | 552 6,792 | 594 7,736 | 576 8,310 | 538 8,664 | | 752 10,828 | 7 | 1,059 | 1,174 | 1,191 |
| Office chemicals. 284-65,287-89 914 1,068 1,548 1,548 1,64 | Industrial chemicals | 281-82,286 | 2,810 | 2,828 | 3,057 | 3,281 | 3,374 | 3,531 | 3,939 | 4,340 | | 5,225 | 5,152 |
| Petroleum refining and extraction 13.29 2.073 2.074 2.245 2.194 1.971 1.983 1.975 2.162 2.289 2.487 Rubber products 32 2.073 2.074 683 671 655 656 671 675 538 2.487 Primary madulus 331-32,3398-99 426 396 357 732 776 462 465 676 671 700 701 700 | Other chemicals | 284-85,287-89 | 914 | 1,068 | 1,369 | 1,548 | 1,633 | 1,819 | 1,989 | 2,091 | | 2,267 | 2,447 |
| Stone clay, and glass products. 32 472 586 705 825 941 985 697 615 538 455 Primary micals. 331-32,3389-99 226 326 377 720 771 683 773 780 786 771 772 779 780 668 777 773 780 878 278 786 486 777 779 770 10,771 10,577 11,929 13,42 13,776 778 778 778 780 8,183 9,347 10,725 10,988 10,419 9,377 778 779 770 10,771 10,77 | Petroleum refining and extractionRubber products | 13,29 | 2,003 | 2,074 | 2,245 | 2,194 | 1,971 | 1,883 | 1,975 (D) | 2,162 (D) | 2,289 (D) | 2,487 (D) | 2,330 |
| 331-32,3398-99 426 306 357 323 336 462 263 249 255 244 231 225 | | 32 | 472 | 586 | 705 | 825 | 941 | 985 | 697 | 615 | 538 | 455 | 479 542 |
| 56. 634 773 780 800 633 718 726 736 748 5 351-56,358-59 2,227 7,911 9,312 10,701 10,701 10,577 11,929 13,342 13,575 13,720 5 351-56,358-59 2,2273 2,301 2,321 2,384 2,582 2,618 2,587 10,419 5 351-56,358-59 2,277 2,301 2,321 2,384 2,582 2,618 2,587 3,301 3.66 6,682 8,158 9,037 9,271 9,767 10,449 9,975 9,277 9,274 3.66 3,555 4,500 5,147 5,174 5,147 5,147 5,147 5,147 5,147 5,146 3,654 3,654 3,584 3,655 3,496 3,177 3.61-64,369 1,421 1,524 1,174 921 1,160 1,225 (D) (D) (D) (D) 3.73-75,379 | | 331-32,3398-99 333-36 | 426 285 | 396 305 | 357 326 | 323 | 336 450 | 249 462 | 252 368 | 244 | 231 | 225 | 224 318 |
| ting, and accounting machines 357 4,944 5,634 7,011 8,418 8,380 8,193 9,347 10,725 10,988 10,419 3cy, except electrical 351-56,358-59 2,283 2,277 2,301 2,303 2,321 2,384 2,582 2,618 2,587 3,301 anent ment | Fabricated metal products | 34 | 565 | 634 | 773 | 780 | 800 | 633 | 718 | | | 748 | 764 |
| 351-56,358-59 2,283 2,277 2,301 2,3021 2,321 2,384 2,582 2,618 2,587 3,301 351-56,358-59 3,66,386-59 8,158 9,037 9,271 9,767 10,449 9,975 9,575 9,267 8,865 365 3,648 32,456 4,500 5,147 5,174 5,117 5,455 4,798 4,159 3,584 (S) 361-64,369 1,342 1,810 2,354 2,826 3,357 3,630 3,684 3,655 3,496 3,177 361-64,369 1,421 1,524 1,160 1,225 (D) (D) (D) (D) 373-75,379 361-64,369 1,421 1,406 12,092 13,567 13,462 14,596 14,264 14,858 373-75,379 4,186 4,764 5,649 6,066 5,939 5,766 5,584 9,063 377-75,379 4,186 4,016 4,764 5,649 6,066 5,939 5 | Office, computing, and accounting machines | 357 | 4,944 | 5,634 | 7,011 | 8,418 | 8,380 | 8,193 | 9,347 | | | 10,419 | 10,650 |
| 365 3.555 4.500 5.174 5.174 5.175 5.455 4.798 4.159 3.584 (S) (D) (D) (D) (D) (D) (D) (D) (D) (D) (D | Other machinery, except electrical | 351-56,358-59 | 2,283 | 2,277 | 2,301 | 2,303 | 2,321 | 2,384 | 2,582 | 2,618 | | 3,301 | 3,423 |
| 365 364 324 362 350 133 139 (D) | Electrical equipment | 36 | 6,682 | 8,158 | 9,037 | 9,271 | 9,767 | 10,449 | 9,975 | | | 8,865 | 9,689 |
| 361-64,369 3,555 4,500 5,147 5,174 5,117 5,455 4,798 4,159 3,584 (S) 3,584 (S) 3,614 3,177 3,141 3,174 | Radio and TV receiving equipment | 365 | 364 | 324 | 362 | 350 | 133 | 139 | (D) | | | (D) | 93 |
| 361-64,369 1,421 1,524 1,174 921 1,160 1,225 (D) | Communication equipment | 366 | 3,555 | 4,500 | 5,147 | 5,174 | 5,117 | 5,455 | 4,798 | | | (S) | 3,435 |
| 373-75,379 4,186 4,010 4,764 5,649 6,066 5,939 5,766 5,533 8,756 14,264 14,858 5,533 8,726 5,533 8,726 5,533 8,726 5,533 | Other electrical equipment | 361-64,369 | 1,421 | 1,524 | 1,174 | 921 | 1,160 | 1,225 | (D) | (a) | | (D) | 2,733 |
| 373-75,379 | Transportation equipment | 37 | 8,621 | 8,991 | 10,406 | 12,092 | 13,567 | 13,462 | 13,910 | | | 14,858 | 15,726 |
| . 373-75,379 114 227 258 279 330 356 361 337 283 262 | Motor vehicles and motor vehicles equipment | 371 | 4,321 | 4,754 | 5,384 | 6,164 | 7,171 | 7,167 | 7,783 | 8,756 | α. | 9,063 | <u>Q</u> |
| 3/2,3/6 4,186 4,010 4,764 5,649 6,066 5,939 5,766 5,503 5,38/ 5,533 | Other transportation equipment | 373-75,379 | 114 | 227 | 258 | 279 | 330 | 356 | 361 | | | 262 | (a) |
| | Aircraft and missiles | 372,376 | 4,186 | 4,010 | 4,764 | 5,649 | 990'9 | 5,939 | 5,766 | | | 5,533 | 6,248 |

See explanatory information and SOURCE at end of table.

Table A-7. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1982-92

| | | | | | | | | | | | Д. | Page 2 of 2 |
|--|--|---|---|---|---|---|---|--|--|--|---|--|
| Industry and size of company | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| | | | | | | [Dol] | [Dollars in millions] | [St | | | | |
| Distribution by industry: | | | | | | | | | | | | |
| Professional and scientific instruments | . 38 | \$3,407 | \$3,816 | \$4,211 | \$4,622 | \$4,752 | \$4,950 | \$5,339 | \$5,729 | \$6,318 | \$6,840 | \$7,426 |
| Scientific and mechanical measuring instruments | 381-82 | 1,363 | 1,605 | 1,671 | 1,596 | 1,521 | 1,598 | 1,863 | 2,205 | 2,696 | 3,017 | 3,108 |
| Optical, surgical, priorographic, and order instruments | 384-87 | 2,044 | 2,211 | 2,540 | 3,026 | 3,231 | 3,352 | 3,476 | 3,524 | 3,621 | 3,823 | 4,318 |
| Other manufacturing industries 1/ | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 | 493 | 2,084 | 3,252 | 361 | 380 | 380 | (D) 7,257 | (D) 10,302 | (D) 16,351 | (D) 22,941 | (D) 24,211 |
| Distribution by size of company [Based on number of employees] | | | | | | | | | | | | |
| Total | | \$40,105 | \$44,588 | \$51,404 | \$57,043 | \$59,932 | \$61,403 | \$66,672 | \$73,501 | \$81,602 | \$90,580 | \$96,654 |
| Fewer than 500 2/ | | 2,411 N/A 3,241 2,224 6,448 25,781 | 3,781 N/A 3,438 2,080 7,228 28,061 | 3,781 1,341 4,618 2,764 8,546 30,354 | 5,127 1,531 5,249 3,350 8,366 33,421 | 6,203 1,765 6,243 3,455 8,489 33,778 | 6,200 1,610 6,281 3,753 9,681 33,878 | (S) 1,748 6,820 4,075 10,512 36,785 | (S) 1,934 7,546 4,509 11,631 40,703 | (S) 2,144 8,363 4,997 12,890 45,106 | 11,285 7,819 9,403 7,233 12,397 42,443 | 12,381 8,232 11,259 7,821 12,960 44,001 |

^{1/} Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

^{2/} Data for 1982-83 are for companies with fewer than 1,000 employees.

^{3/} Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the NOTES: Company funds include all funds for industrial R&D work performed within company facilities from all sources except the Federal Government. The funds may be the companies' own or from outside organizations such as research institutions, universities and colleges, nonprofit organizations, other companies, and state governments. Company-financed R&D not performed within the company is excluded. nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

 ⁽D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 N/A = Not available KEY:

Table A-8. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1992

| | | | | | | | | Page 1 of 2 |
|---|-------------------------------------|--|--------------------------------|----------------------------|---------------------------------|--|----------------------------------|-----------------------------------|
| Industry | SIC code | Total | | | Size | Size of company | | |
| | | | Fewer than 500 employees | 500 to 999 employees | 1,000 to 4,999 employees | 5,000 to 9,999 employees | 10,000 to 24,999 employees | 25,000 or more employees |
| | | | | ŭ | [Dollars in millions] | [6] | | |
| Total | | \$96,654 | \$12,381 | \$8,232 | \$11,259 | \$7,821 | \$12,960 | \$44,001 |
| Food, kindred, and tobacco products Textiles and apparel Lumber, wood products, and furniture Paper and allied products Chemicals and allied products | 20,21 22,23 24,25 26 26 | 1,411 259 (D) 1,191 16,420 | 72 23 45 50 802 | 39 11 8 26 469 | 158 136 54 59 2,792 | 184 12 39 43 1,528 | (D) (D) (S) (S) | 814 (D) (D) 679 4,348 |
| Industrial chemicals | 281-82,286 283 284-85,287-89 | 5,152 8,822 2,447 | 157 372 273 | (D) (D) 253 | 530 1,880 382 | 627 621 280 | 000 | 000 |
| Petroleum refining and extraction | 13,29 30 32 33 | 2,330 1,337 479 542 | 88 365 38 51 | 136 136 15 | 175 (S) 39 126 | (S) (D) (D) (D) (D) (D) (D) (D) (D) (D) (D | 242 90 (D) | 1,769 (D) (D) (D) |
| Ferrous metals and products | 331-32,3398-99 333-36 | 224 318 | 21 | (a) (a) | 48 | 62 (D) | (D) (D) | (D) (D) |
| Fabricated metal products | 34 | 764 14,073 | 215 1,193 | 40 | 171 | 121 (S) | 217 | 0 7,341 |
| Office, computing, and accounting machines | 357 351-56,358-59 | 10,650 | 356 837 | 287 | 861 | (a) (a) | (D) (D) | (a) (a) |
| Electrical equipment | 36 | 689'6 | 1,641 | 350 | 1,626 | 673 | 1,829 | 3,570 |
| Radio and TV receiving equipment | 365 366 367 361-64,369 | 93 3,435 3,428 2,733 | 19 454 845 323 | (D) 221 (D) | 42 540 760 284 | 0000 | 2,0,0,0 | ° (a) (a) |
| Transportation equipment | 37 | 15,726 | 34 | 56 | 157 | 426 | 687 | 14,366 |
| Motor vehicles and motor vehicles equipment | 373-75,379 372,376 | (D) (D) 6,248 | 3 9 22 | 25 (D) (D) | 59 (D) | 271 (D) (D) | (a) (a) | (D) (D) 5,448 |

See explanatory information and SOURCE at end of table.

Table A-8. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1992

| Page 2 of 2 | | 25,000 or more employees | | \$3,876 | 1,385 | 2,491 | (D) 9885 |
|-------------|-----------------|----------------------------------|-----------------------|---|---|---|--|
| | | 10,000 to 24,999 employees | | \$229 | (D) | (D) | (D) 940 |
| | Size of company | 5,000 to 9,999 employees | [8] | \$556 | 196 | 360 | 100 (S) |
| | Size | 1,000 to 4,999 employees | [Dollars in millions] | \$1,141 | 629 | 462 | 2,380 |
| | | 500 to 999 employees | 2 | \$510 | (D) | (D) | (D) 6022 |
| | | Fewer than 500 employees | | \$1,114 | 929 | 538 | 6,501 |
| | Total | | | \$7,426 | 3,108 | 4,318 | (D) 24,211 |
| | SIC code | | | 38 | 381-82 | 384-87 | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 |
| | Industry | | | Professional and scientific instruments | Scientific and mechanical measuring instruments | opical, sugical, protographic, and office instruments | Other manufacturing industries |

(D) = Data have been withheld to avoid disclosing operations of individual companies. (S) = Data have been withheld because of imputation of more than 50 percent. KEY:

Table A-9. Company-financed R&D performed outside the United States by U.S. domestic companies and their foreign subsidiaries, by selected industry: 1982-92

| Page 1 of 1 | 1992 | | \$9,981 | 68 2,683 | 1,042 | 119 41 20 98 1,450 554 | (D) 180 169 (D) | (D) | (D) 406 | 700 (D) 860 |
|-------------|----------|-----------------------|---------|--|---|--|----------------------------------|--------------------------|--|--|
| | 1991 | | \$9,147 | 2,401 | 1,009 | 107 38 20 86 1,476 651 | 2 151 164 334 | 2,402 | 2,166 | 656 467 778 |
| | 1990 | | \$7,952 | 2,007 | 720 1,287 | 76 59 26 95 1,451 | (D) 174 185 (D) | 2,055 | 1,901 | 611 344 415 |
| | 1989 | | \$6,706 | 1,532 | 609 | (D) 24 (D) 1,432 573 | (D) 199 160 (D) | 1,916 | 1,501 | 474 269 256 |
| | 1988 | | \$6,208 | 27 1,548 | 855 | 59 (D) 23 1,326 591 | (D) 290 246 (D) | 1,750 | 1,477 | 404 178 146 |
| | 1987 | [Dollars in millions] | \$5,226 | 37 | 625 618 | 47 (D) 18 40 1,233 432 | 0 189 204 39 | (D) | (D) 237 | 317 138 64 |
| | 1986 | [DO] | \$4,624 | 1,071 | 579 492 | (S) 28 (S) (S) | (D) 150 25 | (D) | (D) | 212 141 27 |
| | 1985 | | \$3,650 | 75 | 444 | (D) (D) (D) (D) (D) (D) (D) (D) (D) (D) | (D) 117 24 | 1,025 | <u>(a) (a)</u> | 169 125 18 |
| | 1984 | | \$3,633 | 70 | 385 | 101 60 9 21 740 537 | (D) 30 30 | 206 | <u>0</u> 0 | 263 131 8 |
| | 1983 | | \$3,269 | 63 729 | 368 | 103 19 10 23 577 482 | E E 88 | 880 | EE | (E) 92 10 |
| | 1982 | | \$3,094 | 64 | 319 | 133 10 9 25 494 467 | () 38 | 843 | EE | 237 |
| | SIC code | | | 20,21 | 281-82,284-89 | 13,29 33 34 35 85 86 | 365 366 367 361-64,369 | 37 | 371,373-75,379 372,376 | 38 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 |
| | Industry | | Total | Food, kindred, and tobacco products 1/ | Industrial and other chemicals Drugs and medicines | Petroleum refining and extraction | Radio and TV receiving equipment | Transportation equipment | Motor vehicles and other transportation equipment. | Professional and scientific instruments |

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

NOTE:

Data are reported in current U.S. dollars. As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

(D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data not separately available, but are included in total.

KEY:

Table A-10. Federal funds for industrial R&D performance, by industry and size of company: 1982-92

| Total | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|--|-------------------------------------|--------------------------------|---------------------------------|----------------------------|-------------------------------|--|-------------------------------|--------------------------|---|----------------------|----------------------|--------------------------|
| Total | | | | | | [Dollars | [Dollars in millions] | | | | | |
| | | \$18,545 | \$20,680 | \$23,396 | \$27,196 | \$27,891 | \$30,752 | \$30,343 | \$28,554 | \$28,125 | \$26,372 | \$24,660 |
| Distribution by industry | | | | | | | | | | | | |
| Food, kindred, and tobacco products 1/ | 20,21 22,23 24,25 26 26 | (D) 0 0 0 0 407 | (D) (D) (D) (D) (D) | (D) 0 (D) 191 | (D) 0 (D) (D) 230 | (C) 0 (D) 179 | (D) 0 (D) (D) 190 | (D) (D) (D) 238 | (D) | 00002 | (S) (D) 209 | |
| Industrial chemicals | 281-82,286 283 284-85,287-89 | 396 (D) (D) | 386 (D) | 183 (D) (D) | 217 (D) (D) | 178 | 185 (D) (D) | 232 (D) (D) | (0) | (D) | 165 (D) | (S) (S) (S) |
| Petroleum refining and extraction. Rubber products | 13,29 30 32 33 | (D) (D) 276 | (D) (D) 384 | 0000 | 0000 | (a) (a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c | (D) 10 | 22 (D) (D) | (S) (D) (D) (D) | © <u>0</u> 0 0 | (D) (D) 8 | 6 (a) (s) |
| Ferrous metals and products | 331-32,3398-99 333-36 | 00 | 00 | (D) | (O) | (D) 8 | (Q) | 1 9 | 00 | <u>0</u> 0 | 7 | (a) (b) |
| Fabricated metal products | 34 | 60 | 67 1,116 | 1,192 | 49 | 95 (D) | 150 (D) | 163 (D) | 178 (D) | 203 | 226 1,055 | 293 1,062 |
| Office, computing, and accounting machines | 357 351-56,358-59 | (Q) (Q) | (Q) (Q) | (Q) | (a) | (D) 75 | (D) 44 | 00 | 00 | 00 | <u>(a)</u> | (D) |
| Electrical equipment | 36 | 4,241 | 4,523 | 4,741 | 5,161 | 5,213 | 5,399 | 4,153 | 3,743 | 4,133 | 4,550 | 3,857 |
| Radio and TV receiving equipment | 365 366 367 367 | (D) 2,284 398 (D) | (D) 2,798 359 (D) | (D) 3,538 477 (D) | (D) 4,223 559 (D) | 0 4,552 (D) (D) | 0 4,729 656 14 | 0 (0) | 0 (0 (0) | ° @ @ @ | 0 (0 (0) | (D) (D) 250 (D) |
| Transportation equipment | 37 | (Q) | (D) | (D) | (a) | 17,708 | 20,784 | 20,865 | 19,262 | 17,097 | 12,570 | 10,738 |
| Motor vehicles and motor vehicles equipment Other transportation equipment | 373-75,379 372,376 | 476 (D) 10,265 | 564 (D) 11,396 | 673 (D) 14,094 | 820 (D) 16,582 | (D) (D) 14,984 | (D) (D) 18,519 | (D) (D) 18,402 | (D) (D) 16,828 | (D) (D) 15,248 | (D) (D) 11,096 | (D) (D) 9,872 |

See explanatory information and SOURCE at end of table.

Table A-10. Federal funds for industrial R&D performance, by industry and size of company: 1982-92

| | | | | | | | | | | | | 4 2 2 2 2 |
|--|--|-----------------------------------|-----------------------------------|--|---|---|---|---|--|---|---|---------------------------------------|
| Industry and size of company | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| | | | | | | [Dollars | [Dollars in millions] | | | | | |
| Professional and scientific instruments | 38 | \$523 | \$450 | \$391 | \$391 | \$351 | \$272 | \$191 | \$263 | \$737 | \$1,865 | \$2,226 |
| Scientific and mechanical measuring instruments | 381-82 | (D) | (D) | (D) | (D) | (D) | (D) | (D) | (D) | (D) | (D) | 2,147 |
| Opiica, surgica, protograpriic, aru otrier instruments | 384-87 | (D) | (a) | (<u>O</u>) | (D) | (a) | (D) | (a) | (D) | (D) | Q) | 79 |
| Other manufacturing industries 1/ | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 | (D) 1,000 | (D) 1,253 | (D) 1,653 | (D) 2,313 | 2,706 | (D) 2,700 | (D) 3,256 | (D) 3,729 | (D) 4,442 | (D) 5,505 | (D) 5,892 |
| Distribution by size of company Based on number of employees] | | | | | | | , | | | | | |
| Total | | \$18,545 | \$20,680 | \$23,396 | \$27,196 | \$27,891 | \$30,752 | \$30,343 | \$28,554 | \$28,125 | \$26,372 | \$24,660 |
| Fewer than 500 2/ | | 523 N/A 623 527 1,495 | 641 N/A 740 718 2,271 | 621 98 902 487 2,805 18,483 | 739 117 991 672 2,743 21,933 | 868 137 1,229 796 2,004 23,213 | 963 115 981 748 2,362 25,583 | 816 131 1,093 864 1,705 25,734 | 901 97 958 740 1,129 24,709 | 895 (S) 881 257 1,526 24,436 | 1,887 181 1,050 816 3,373 19,065 | 2,115 178 1,156 851 3,459 |

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Data for 1982-83 are for companies with fewer than 1,000 employees. 3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

(D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 N/A = Not available

KEY:

now better reflect R&D performance among firms in the nonmanufacturing industries and small firms NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics in all industries. See the technical notes for more information.

Table A-11. Federal funds for industrial R&D performance, by industry and size of company: 1992

Page 1 of 1 Size of company SIC code Total Industry 25,000 or 10,000 to 500 to 1,000 to 5,000 to Fewer than 999 4,999 9,999 24,999 more 500 employees employees employees employees employees employees [Dollars in millions] \$1,156 \$851 \$3,459 \$16,901 \$24,660 \$2,115 \$178 0 n 20.21 Food, kindred, and tobacco products..... 0 (D) (D) 0 0 (S) (D) 22 23 Textiles and apparel..... (D) O (D) (D) 0 0 0 24,25 Lumber, wood products, and furniture..... (D) n 0 0 Ω (D) Paper and allied products..... 26 (D) (D) (D) (D) (D) 28 (S) Chemicals and allied products..... (D) 0 (D) 6 (D) (D) (S) 281-82,286 Industrial chemicals..... (D) (D) (D) Ω (D) Ó (S) 283 Drugs and medicines..... (D) (D) (D) (D) 0 284-85,287-89 (S) (S) Other chemicals..... (D) 8 (D) 0 13,29 (D) 0 Petroleum refining and extraction..... 0 n (D) (D) 0 n 30 Rubber products..... (D) (D) (D) (D) 0 0 32 Stone, clay, and glass products..... (D) (D) (S) 0 4 (S) 33 Primary metals..... (D) (D)0 0 0 331-32,3398-99 0 (D) Ferrous metals and products..... (D) (D) (D) 0 333-36 Nonferrous metals and products..... 0 43 2 (D) (D) 293 Fabricated metal products..... (D) (D) (D) 1,062 79 0 (S) 35 Machinery... (D) (D) 0 0 (D) (D) Office, computing, and accounting machines..... 357 (D) (D) (D) (D) Other machinery, except electrical 351-56,358-59 (D) 3.560 (D) (D) (D) (D) 3.857 93 36 Electrical equipment..... 0 0 (D) 0 0 (D) 365 Radio and TV receiving equipment..... (D) (D) 0 (D) 16 (D) Communication equipment..... 366 (D) (D) (D) 47 (D) 250 367 Electronic components..... (D) (D) (D) (D) 28 361-64,369 (D) Other electrical equipment..... 8,771 (D) (D) 1,918 (D) 10,738 0 37 Transportation equipment..... (D) (D) 0 (D) 0 371 Motor vehicles and motor vehicles equipment...... 373-75,379 0 Other transportation equipment..... (D) 1,918 7,890 (D) 0 372,376 9,872 n Aircraft and missiles. (D) (D) \$1,803 (D) \$143 \$44 38 \$2,226 Professional and scientific instruments..... (D) (D) (D) (D) (D) 381-82 2,147 37 Scientific and mechanical measuring instruments... Optical, surgical, photographic, and other (D) 0 0 (D) (D) (S) 384-87 79 0 27,31,39 61 Other manufacturing industries..... 600 (D) (D) (S) 83 07-10, 12-17, 5,892 1.770 Nonmanufacturing industries 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89

(S) = Data have been withheld because of imputation of more than 50 percent.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

Table A-12. Number of R&D-performing companies reporting Federal R&D funds and total number of R&D-performing companies, by industry and size of company: 1992

| | | | | | | | Size of company | pany | | | | | |
|--|------------------------------------|----------------------------|-------------|-------------------------|-------------------------|----------------------------|-----------------------------|-----------------------------|---------------|-------------------------|-------------------------------|-----------------------------|---------------|
| | SIC code | Fewer than 50 employees | 500 res | 500 to 999 employees | 500 to 999 employees | 1,000 to 4,99 employees | 1,000 to 4,999 employees | 5,000 to 9,999 employees | 9,999 yees | 10,000 empl | 10,000 to 24,999 employees | 25,000 or more employees | or more |
| | | Total | Federal | Total | Federal | Total | Federal | Total | Federal | Total | Federal | Total | Federal |
| | | 33,529 | 968 | 883 | 25 | 1,171 | 11 | 260 | 41 | 191 | 37 | 121 | 34 |
| Food, kindred, and tobacco products Textiles and apparel | 20,21 | 1,126 | 0 0 | 30 | 00 | 63 | 0 0 | 21 | 0 0 | 13 | 0 0 | 10 (D) | ° (<u>0</u> |
| Lumber, wood products, and furniture Paper and allied products | 24,25 | 356 48 | (Q) ° | (D) | 00 | 33 | 00 | 6 | 00 | 10 | 0 0 | (D) | (<u>0</u> ° |
| Chemicals and allied products | 28 | 1,893 | 72 | 61 | (Q) | 74 | (D) | 18 | <u>(</u>) | 24 | | 7 | <u>Q</u> |
| Industrial chemicals | 281-82,286 283 284-85,287-89 | 634 368 891 | 0 9 9 | 25 8 28 | (a) (a) | 28 17 29 | (D) | 000 | <u> </u> | 5 <u>(</u>) (<u>0</u> | 000 | <u>0</u> 000 | <u>@</u> ° ° |
| Petroleum refining and extraction Rubber products | 13,29 | 1,736 | 999 | (D) 35 | 000 | 11 50 | 000 | 000 | 000 | 66 | (a) (c) | 8 (Q) (E | (a) 0 (c) |
| | 33 | 214 | 35 | 40 | 0 | 48 | <u> </u> | <u>)</u> = | <u>(a)</u> | ° (i) | 00 | <u>0</u> 0 | <u>0</u> 0 |
| Ferrous metals and products | 331-32,3398-99 333-36 | 69 | 00 | 31 | 00 | 30 | 0 8 | (Q) (Q) | (a) | 00 | (a) | <u>()</u> | ° (a) |
| Fabricated metal products | 34 | 574 | 73 | 65 116 | (<u>a</u>) | 73 | <u>0</u> 0 | 1 0 0 | 0 0 | 17 | 00 | 0 | ° (<u>0</u> |
| Office, computing, and accounting machines | 357 351-56,358-59 | 855 3,745 | 2 85 | 42 | 00 | 53 | (a) | 12 | (a) | <u>(a) (a)</u> | 00 | (D) (D) | (<u>a)</u> |
| Electrical equipment | 36 | 2,785 | 253 | 86 | (<u>D</u>) | 124 | 12 | 4 | (D) | 13 | (D) | 10 | 7 |
| Radio and TV receiving equipment | 365 | 153 | 0 | 00 | 0 0 | 0.5 | 0.0 | 00 | 00 | 00 | 0 (| ٥ (| ٥ (|
| Communication equipment | 367 367 361-64,369 | 1,399 | 202 | 4 29 | 1) | 47 | 000 | 2 7 7 | 999 | 000 | <u>0</u> °0 | 000 | <u>0</u> 00 |
| | 37 | 390 | (a) | 37 | (D) | 62 | 13 | 25 | g | 12 | (a) | 13 | 1 |
| Motor vehicles and motor vehicles equipment | 373-75,379 | 10 | (D) | 7 10 | ° (<u>0</u> | <u>©</u> © | 00 | <u>0</u> 0 | (D) | <u> </u> | 0 (D) | <u>(</u> (0) | <u>(0</u> (0) |

See explanatory information and SOURCE at end of table.

Table A-12. Number of R&D-performing companies reporting Federal R&D funds and total number of R&D-performing companies, by industry and size of company: 1992

| Page 2 of 2 | | r more yees | Federal | (D) | (D) | <u>(</u>) | O 50 |
|-------------|-----------------|-------------------------------|---------|---|---|-------------------|--|
| Δ. | | 25,000 or more employees | Total | (D) | Ω) | (D) | (D) 40 |
| | | 10,000 to 24,999 employees | Federal | (D) | (D) | 0 | (D) |
| ; | | 10,000 to emplo | Total | (D) | (Q) | <u>(a)</u> | (0) |
| | | 9,999 yees | Federal | (D) | (<u>O</u> | 0 | 0 74 7 |
| | any | 5,000 to 9,999 employees | Total | 80 | <u>(D</u> | (D) | o 6 |
| | Size of company | , 4,999 yees | Federal | 10 | (D) | (a) | (D) 35 |
| | | 1,000 to 4,999 employees | Total | 72 | 37 | 35 | 271 |
| | | o 999 Jyees | Federal | 7 | (D) | <u>Q</u> | 0.1 |
| | | 500 to 999 employees | Total | 75 | 30 | 45 | 27 |
| | | 1 500 es | Federal | 21 | (D) | (D) | 338 |
| | | Fewer than 500 employees | Total | 2,282 | 1,229 | 1,053 | 15,873 |
| | SIC code | | | 38 | 381-82 | 384-87 | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 |
| | | Industry | | Professional and scientific instruments | Scientific and mechanical measuring instruments | other instruments | Other manufacturing industries |

Key: (D) = Data have been withheld to avoid disclosing operations of individual companies.

Table A-13. Industry-administered federally funded R&D centers (FFRDCs)--funds by character of work, full-time-equivalent (FTE) R&D scientists and engineers, and total number of employees: 1990-92

Page 1 of 1 1991 1992 Item 1990 \$2,764 \$2,722 \$2,746 Total R&D funds..... 499 461 475 Basic research..... 428 502 Applied research..... 488 1,777 1,833 1,769 Development..... Number of FTE R&D scientists and engineers 1/ \$15,205 \$14,890 \$14,333 42,007 43,839 44,395 Total employees 2/.....

NOTE: Industry-administered Federally funded research and development centers (FFRDCs) conduct R&D almost exclusively for use by the Federal Government. Data for these FFRDCs administered by industry are included in Federal R&D support under the industry classifications of the administering firms. See the technical notes for a listing of industry-administered FFRDCs and their locations.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-14. Number of R&D-performing companies in manufacturing and nonmanufacturing industries, by size of company: 1992

| Size of company [Based on number of employees] | Total | Manufacturing | Nonmanufacturing |
|--|--------|---------------|------------------|
| Total | 36,155 | 19,660 | 16,49 |
| Fewer than 500 | 33,529 | 17,656 | 15,873 |
| 500 to 999 | 883 | 712 | 171 |
| 1,000 to 4,999 | 1,171 | 900 | 27 |
| 5,000 to 9,999 | 260 | 171 | 89 |
| 10,000 to 24,999 | 191 | 140 | 5 ⁻ |
| 25,000 or more | 121 | 81 | 40 |

^{1/} These data were recorded in January of the year following the year indicated.

^{2/} These data were recorded in March of the year indicated.

Table A-15. Concentration of total, Federal, and company and other R&D funds and net sales of R&D-performing companies, by size of R&D program: 1982-92

| | | | | | | | | | | Р | age 1 of 1 |
|---|---|--|--------------------------------------|--------------------------------------|---------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--|--|
| Companies ranked by size of R&D program | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| | | Perce | ent of total (d | company, Fe | ederal, and | other) R&D | funds ranke | d by size of | total R&D fu | ınds | |
| First 4 (1-4) | 20 12 19 13 16 9 | 19 11 17 13 17 9 6 | 17 13 17 13 18 9 6 | 18 12 17 13 16 9 | 19 11 14 13 15 10 8 | 19 12 16 12 14 8 6 | 18 12 17 12 15 8 7 | 19 13 16 12 15 8 6 | 18 13 15 12 16 9 | 16 8 12 11 15 12 6 | 15 8 13 12 15 12 6 |
| | | | Perce | ent of Feder | al R&D fund | ls ranked by | size of Fed | eral R&D fu | unds | | |
| First 4 (1-4) | N/A N/A N/A N/A N/A N/A N/A | N/A N/A N/A N/A N/A N/A | 30 15 26 17 10 1 | 29 15 27 16 7 2 | 30 16 28 15 7 2 | 31 18 27 15 7 1 | 32 18 28 15 6 3 0 | 36 15 30 11 6 1 | 38 16 26 12 6 | 14 21 21 15 13 3 | 14 19 21 17 13 (S) 2 |
| | P | ercent of co | mpany and | other (exce | pt Federal) F | R&D funds r | anked by siz | ze of compa | any and othe | r R&D fund | 5 |
| First 4 (1-4) | N/A N/A N/A N/A N/A N/A | N/A N/A N/A N/A N/A N/A | 22 8 12 12 18 11 7 | 23 7 12 12 18 10 7 | 20 7 12 10 16 10 8 | 20 7 12 11 16 10 8 | 21 7 12 12 16 10 8 | 22 7 13 12 16 10 8 | 21 7 12 13 17 10 8 | 17 (S) 10 10 16 15 7 | 16 (S) (S) (S) 16 15 |
| | | | | Percent of | f net sales ra | anked by siz | ze of total R& | &D funds | | | |
| First 4 (1-4) | N/A N/A N/A N/A N/A N/A | N/A N/A N/A N/A N/A N/A | 7 4 5 8 12 13 14 | 8 4 5 8 12 13 | 8 5 5 7 10 10 9 | 7 5 5 7 11 8 12 | 7 5 5 6 11 9 | 6 5 5 5 12 8 11 | 8 4 5 12 9 12 | 7 3 4 4 12 9 | 7 4 4 4 12 9 |

KEY: N/A = Not available

(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: Companies were ranked individually for each year; therefore, particular companies comprising the size groups may have changed from year to year.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more infromation.

Table A-16. Domestic net sales of R&D-performing companies, by industry and size of company: 1991-92

| | | | | | | | | Page 1 of 3 |
|---|-------------------------------------|---|--|---|---|---|--|---|
| | SIC code | Total | | | Size of company | прапу | | |
| | | | Fewer than 500 employees | 500 to 999 employees | 1,000 to 4,999 employees | 5,000 to 9,999 employees | 10,000 to 24,999 employees | 25,000 or more employees |
| | | | | | [Dollars in millions] | | | |
| | 11 | | | | 1991 | | | |
| Total | | \$2,939,040 | \$283,016 | \$88,069 | \$400,422 | \$312,691 | \$552,226 | \$1,302,616 |
| Food, kindred, and tobacco products | 20,21 22,23 24,25 26 28 | 254,333 39,041 22,891 110,152 271,027 | 7,373 2,195 4,228 2,414 27,341 | 5,987 (D) 1,229 11,830 10,868 | 38,063 10,665 8,250 10,320 44,396 | 29,746 3,376 3,616 9,072 30,354 | 44,836 (D) (D) 31,478 87,543 | 128,328 (D) (D) 45,038 70,525 |
| Industrial chemicals | 281-82,286 283 284-85,287-89 | 118,243 78,029 74,755 | 2,890 15,301 9,150 | 6,212 (D) (D) | 18,672 12,389 13,335 | 13,642 5,514 11,198 | 41,447 32,686 13,410 | 35,380 (D) (D) |
| Petroleum refining and extraction | 13,29 30 32 33 | 241,341 49,739 27,741 87,303 | 2,331 14,176 2,156 4,989 | 6 6 6 6 6 6 6 6 6 6 6 | 7,987 14,291 3,874 18,547 | 15,547 3,940 2,792 13,926 | 54,737 4,817 14,205 20,997 | 160,339 (D) (D) (D) |
| Ferrous metals and products | 331-32,3398-99 333-36 | 48,599 38,704 | 2,465 2,524 | <u>Q</u> Q | 11,392 7,155 | 7,218 6,708 | 8,529 12,468 | <u>(a) (a)</u> |
| Fabricated metal products | 34 | 63,205 182,426 | 8,665 28,937 | 4,835 | 16,830 37,097 | 10,443 22,663 | 22,432 20,084 | 0 63,585 |
| Office, computing, and accounting machines | 357 351-56,358-59 | 69,988 112,438 | 2,983 25,954 | <u>0</u> 0 | 8,661 28,436 | 14,059 8,604 | <u>(a) (a)</u> | 38,657 24,928 |
| Electrical equipment | 36 | 207,759 | 35,059 | 6,981 | 30,661 | 12,867 | 34,940 | 87,251 |
| Radio and TV receiving equipment | 365 366 367 361-64,369 | 10,677 46,126 44,019 106,937 | 710 4,264 8,639 21,446 | (D) (D) 2,522 3,179 | 874 6,399 12,637 10,751 | 0 0 7,993 4,874 | (D) (D) (D) 13,369 | (D) 27,292 (D) 53,318 |
| Transportation equipment | 37 | 370,104 | 2,457 | 2,570 | 25,614 | 35,958 | 29,041 | 274,464 |
| Motor vehicles and motor vehicles equipment Other transportation equipment | 373-75,379 372,376 372,376 | 220,622 12,307 137,175 | 493 805 1,159 | 805 751 1,014 | 20,859 1,091 3,664 | (D) (D) 5,602 | (D) (D) 17,658 | (D) (D) 108,078 |
| | | | | | | | | |

See explanatory information and SOURCE at end of table.

Table A-16. Domestic net sales of R&D-performing companies, by industry and size of company: 1991-92

| Federal Holdstrip Findletry Findletr | | | | | | | | | Page 2 of 3 |
|--|--------------|---|---|---|-----------------------------------|---|--|-------------------------------------|---|
| Section Sect | | SIC code | Total | | | Size of com | pany | | |
| 1991 381-82 48,406 27,032 (C) 62,531 538-87 4449 50-92,4449 | | | | Fewer than 500 employees | 500 to 999 employees | 1,000 to 4,999 employees | 5,000 to 9,999 employees | 10,000 to 24,999 employees | 25,000 or more employees |
| 381-32 48-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6 | | | | | | [Dollars in millions] | | | |
| 381-82 | | <u> </u> | | | | 1991 | | | |
| 381-82 | | ć | 6 | | | ! | | | |
| 27,21,23 | unience | 00 00 | 900,000 | 412,162 | 045,446 | 060.0 | 00/54 | 45,337 | \$50,087 |
| 7.7.31.39 0.04.2 4.44 0.01.2.17 10.1.2.17 10.1.2.17 10.1.2.17 10.1.2.17 10.1.2.17 10.2.2.2.2 10.1.2.2.2 10.1.2.2 10 | c, and other | 384-87 | 47,854 | 5,130 | (a) (a) | 8,040 | 3,111 | (a) (a) | 27,095 |
| 20,21 20,22 20,21 20,32 40,122 29,062 47,283 128,97 22,23 43,066 2,001 2,837 12,330 3,864 (D) | | 27,31,39 07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89 | 62,831 853,185 | 26,559 101,974 | 2,128 | 12,496 | 5,761 | 6,794 157,774 | 9,093 369,080 |
| 2021 \$5.063,469 \$299,818 \$93,371 \$427,159 \$1330,318 \$578,204 \$1,334,58 2021 22,23 43,066 2,001 2,537 12,330 3,584 (D) (C) < | | | | | | 1992 | | | |
| 20,21 263,422 43,066 2,001 2,537 40,122 29,062 47,283 1284 (D) (D) </td <td></td> <td></td> <td>\$3,063,469</td> <td>\$299,818</td> <td>\$93,371</td> <td>\$427,159</td> <td>\$330,318</td> <td>\$578,204</td> <td>\$1,334,599</td> | | | \$3,063,469 | \$299,818 | \$93,371 | \$427,159 | \$330,318 | \$578,204 | \$1,334,599 |
| 281-82,286 117,517 3,095 6,398 17,544 13,856 441,132 35,686 284-85,287-89 79,657 10,076 (D) 14,888 11,953 13,890 (II) 13,29 237,516 2,570 498 8,295 15,910 56,655 153,58 13,2,338-99 48,877 4,577 (D) 14,783 2,741 14,272 (II) 331-32,338-99 48,645 1,985 (D) 12,261 7,986 8,285 12,710 (II) 34 68,185 11,059 5,189 17,393 10,870 (II) (II) (II) 11,059 11,059 11,385 11,385 11,385 11,385 11,385 11,395 11,395 11,385 11,395 < | oductsmiture | 20,21 22,23 24,25 26,25 26 | 263,422 43,066 24,874 114,369 279,595 | 11,843 2,001 4,499 2,285 27,079 | 6,139 2,537 1,361 11,927 | 40,122 12,330 9,271 10,860 45,806 | 29,062 3,584 3,946 10,023 32,335 | 47,283 (D) 32,593 90,708 | 128,973 (D) (D) 46,681 71,846 |
| 13,29 237,516 2,570 498 8,295 15,910 56,655 153,90 30 52,926 15,399 (D) 14,783 4,339 4,933 14,272 32 28,815 2,168 (D) 4,269 2,741 14,272 (I 331-32,3398-99 48,645 1,985 (D) 12,261 7,986 8,282 (I 40,232 2,592 (D) 6,795 12,710 (I (I 34 68,185 11,059 5,189 17,393 10,870 23,674 | | 281-82,286 283 284-85,287-89 | 117,517 82,421 79,657 | 3,095 13,908 10,076 | 6,398 (D) (D) | 17,544 13,374 14,888 | 13,856 6,526 11,953 | 41,132 35,686 13,890 | 35,492 (D) (D) |
| 331-32,3398-99 48,645 1,985 (D) 12,261 7,986 8,282 (E) 8,608 6,795 12,710 (II (E) 8,185 11,059 5,189 17,393 10,870 23,674 | lon | 13,29 30 32 33 | 237,516 52,926 28,815 88,877 | 2,570 15,399 2,168 4,577 | 498 (D) (D) | 8,295 14,783 4,269 20,869 | 15,910 4,339 2,741 14,781 | 56,655 4,933 14,272 20,992 | 153,588 (D) (D) (D) |
| 34 68,185 11,059 5,189 17,393 10,870 23,674 | ots | 331-32,3398-99 333-36 | 48,645 | 1,985 | (a) (a) | 12,261 | 7,986 6,795 | 8,282 12,710 | <u>@</u> @ |
| | | 34 | 68,185 | 11,059 | 5,189 | 17,393 | 10,870 | 23,674 | 0 |

See explanatory information and SOURCE at end of table.

Table A-16. Domestic net sales of R&D-performing companies, by industry and size of company: 1991-92

Page 3 of 3

| Industry | SIC code | Total | | | Size of company | pany | | o lo caffe |
|---|--|---------------------------------------|---------------------------------|------------------------------|------------------------------------|--------------------------------|----------------------------------|--------------------------------|
| | | 1 | Fewer than 500 employees | 500 to 999 employees | 1,000 to 4,999 employees | 5,000 to 9,999 employees | 10,000 to 24,999 employees | 25,000 or more employees |
| | | | | | [Dollars in millions] | | | |
| | | | | | 1992 | | | |
| Machinery | 35 | \$193,697 | \$28,502 | \$10,508 | \$40,540 | \$26,054 | \$21,601 | \$66,492 |
| Office, computing, and accounting machines | 357 351-56,358-59 | 76,912 116,785 | 2,896 25,606 | <u>Q</u> Q | 10,141 | 17,011 | (a) (a) | 40,106 26,385 |
| Electrical equipment | 36 | 236,605 | 40,039 | 906'2 | 32,346 | 14,421 | 40,790 | 101,103 |
| Radio and TV receiving equipment. Communication equipment. Electronic components. Other electrical equipment. | 365 366 367 361-64,369 | 13,658 48,692 47,664 126,591 | 700 4,890 9,734 24,715 | (D) (D) 2,685 3,626 | 1,055 6,976 13,007 11,309 | 0 0 8,983 5,438 | (D) (D) (D) (14,503 | 0 (D) (D) 000'29 |
| Transportation equipment | 37 | 380,434 | 2,079 | 3,195 | 28,073 | 36,134 | 29,050 | 281,903 |
| Motor vehicles and motor vehicles equipment | 373-75,379 372,376 | 229,949 13,742 136,743 | 250 935 894 | 924 1,185 1,086 | 23,718 1,317 3,038 | (D) 5,800 | (D) (D) 16,658 | (D) (D) 109,267 |
| Professional and scientific instruments | 38 | 102,522 | 14,357 | 6,100 | 18,588 | 6,756 | 5,165 | 51,556 |
| Scientific and mechanical measuring instruments Optical, surgical, photographic, and other instruments. | 381-82 | 49,892 | 8,149 | (a) | 9,833 | 2,569: | (D) | 23,742 |
| Other manufacturing industries | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 | 60,989 887,577 | 25,941 105,420 | (D) | 12,865 | 7,068 | 7,049 | 380,392 |

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

Table A-17. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982-1992

| Page 1 of 2 | 1992 | 4.2% | | 0.5 (D) (D) (D) (D) (D) | 10.7 | (D) (D) (D) (D) (D) | <u>0</u> 0 | 1.6 | <u>(()</u> | 5 5.7 | (a) (b) (c) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d | 3 7.0 | (C) (D) (D) (D) (D) (D) (D) (D) (D) (D) (D |
|-------------|------------------------------|-------|---------------------------|--|--|-----------------------------------|-----------------------------|---------------------------|--|----------------------|--|--------------------------|---|
| | 1991 | 4.2% | | 0.5 (D) 1.1 5.4 | 4.6 8.9 3.1 | (D) (D) (D) (D) (D) | <u>0</u> 0 | 1.5 | <u></u> <u> </u> | 6.5 | (C) (C) (C) (C) (C) | 7.3 | 0.002 |
| | 1990 | 4.2% | | (D) (D) 1.0 5.3 | 4.5 (D) | (C) (C) (C) (B) | <u>0</u> 0 | 1.4 | 00 | 6.5 | (D) 8.3 (D) (D) | 7.5 | (C) |
| | 1989 | 4.3% | | (D) (D) (D) (D) (D) (D) (D) (D) | 4.2 (D) | 0.9 (D) (D) 0.8 | <u>@</u> @ | 7.9 | (Q) (Q) | 7.3 | 0000 | 8.1 | (D) 13.5 |
| | 1988 | 4.5% | | 00000 | 4.4 8.8 3.4 | 1.0 (D) 0.8 | <u>©</u> | 1.3 | <u>©</u> | 7.5 | <u>(0,6,0)</u> | 8.9 | (D) 16.3 |
| | 1987 | 4.6% | | 0.6 (D) 0.6 (D) 5.3 | 4.7 (D) | 1.0 (D) 2.6 0.9 | <u></u> | 1.5 (D) | (D) 3.0 | 8.2 | 3.2 10.2 10.0 2.7 | 8.7 | (D) 14.7 |
| | 1986 | 4.7% | | (D) 0.6 (D) 5.2 | 6.8 6.8 6.8 7.8 | (D) 2.5 (D) | (D) | 1.5 (D) | (D) 3:0 | 7.9 | 3.6 9.9 (D) | 8.3 | 13.0 |
| | 1985 | 4.4% | | (D) 0.8 (D) 5.0 | 4.4 (D) | 0000 | (D) 4:1 | 1.5 | <u>©</u> | 7.6 | (D) 10.1 9.6 (D) | <u>Q</u> | 3.8 (D) 14.9 |
| | 1984 | 3.9% | | (D) (C) (D) (D) (D) | 0.00 | 0000 | (D) | 6.4 | <u>0</u> 0 | 6.8 | (D) 9.8 7.8 (D) | (a) | 3.4 (D) 15.4 |
| | 1983 | 3.9% | | (D) 0.8 (D) 4.4 | 8. O O | 0007 | <u>Q</u> Q | 1.4 | <u>@</u> @ | 7.9 | (D) 11.5 7.7 (D) | N/A | 4.0 (D) 15.2 |
| | 1982 | 3.8% | | (D) 0.8 1.1 4.3 | 4.0 (D) | 2000 | <u>©</u> | 1.3 | <u>@@</u> | 7.2 | (D) 11.0 6.8 (D) | A/N | 4.5 (D) 17.1 |
| | SIC code | | | 20,21 22,23 24,25 26 26 | 281-82,286 283 284-85,287-89 | 13,29 30 32 33 | 331-32,3398-99 333-36 | 34 | 357 351-56,358-59 | 36 | 365 366 367 361-64,369 | 37 | 373-75,379 372,376 |
| | Industry and size of company | Total | Distribution by industry: | Food, kindred, and tobacco products 1/ | Industrial chemicals Drugs and medicines Other chemicals | Petroleum refining and extraction | Ferrous metals and products | Fabricated metal products | Office, computing, and accounting machines | Electrical equipment | Radio and TV receiving equipment | Transportation equipment | Motor vehicles and motor vehicles equipment |

See explanatory information and SOURCE at end of table.

Table A-17. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982-1992

| _ | |
|----------------|-----------|
| 2006 | 1982 1983 |
| 8.4% 8.6% 8.3% | |
| (a) (a) (a) | |
| (a) (a) (a) | |
| (a) (a) (a) | |
| | |
| 2.5 | |
| N/A N/A 2.3 | |
| 2.0 | |
| 1.7 | |
| 2.8 | |
| 5.5 | |

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries." 2/ Data for 1982-83 are for companies with fewer than 1,000 employees. 3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

(D) = Data have been withheld to avoid disclosing operations of individual companies. $N\!/A$ = Not available KEY:

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

Table A-18. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982-92

| | | | - | | | | | | | | | Page 1 of 2 |
|---|------------------------------------|--------------------------|--------------------------|--------------------------|--|--------------------------|--------------------------|---|--|--------------------------|--------------------------|--------------------------|
| Industry and size of company | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| | | 2.6% | 2.6% | 2.6% | 3.0% | 3.2% | 3.1% | 3.1% | 3.1% | 3.1% | 3.2% | 3.3% |
| Food, kindred, and tobacco products 1/ | 20,21 22,23 24,25 | 0.00.4 4.00.00.4 | 4.00 | 4.0 7.0 7.0 | 0.0 0.0 0.0 0.0 | 0.0 0.0 0.0 0.0 | 0.0 0.0 0.0 | 0 0 0 0 0 | 0.00 3.00 3.00 3.00 3.00 3.00 3.00 3.00 | 0 0 0 4 & 6 6 6 | 0.00 4 0.00 4 | 0 0 0 4 rb 6 0 0 |
| Paper and allied products | 28 28 281-82,286 283 | 3.5 | 3.4 4.2 7.7 | 0.4 6.8 0.0 8.4 | 0.54 0.00 0.00 0.00 0.00 0.00 0.00 0.00 | | 0.0 C 4.8 | 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0 | | 0 70 0 4.80 0 4.80 | 4.8 6.8 | 5.9 4.4 10.7 |
| Other chemicals | 284-85,287-89 13,29 30 32 | 2.3 0.8 1.7 | 2.5 | | 3.1 0.9 1.8 2.3 | | | | | | 3.0 1.0 2.3 1.6 | 3.1 1.0 2.5 1.7 |
| Primary metals | 33 331-32,3398-99 333-36 | 0.8 | 0.8 | 0.9 | 0.0 0.7 4.1 | 1.0 0.7 1.5 | 0.9 | 0.5 | 0.5 | 0.8 | 0.8 | 0.6 0.5 0.8 |
| Fabricated metal products | 34 | 1.2 | 1.3 | 1.4 | 1.4 | 7.4 | 1.2 | 1.1 | 1.2 | 1.1 | 1.2 | 1.1 |
| Office, computing, and accounting machines Other machinery, except electrical | 357 351-56,358-59 | 10.4 | 10.0 | 10.5 | 12.4 | 12.4 | 12.3 | 11.2 | 13.1 | 14.4 | 14.9 | 13.8 |
| Electrical equipment | 36 | 4.4 | 5.0 | 4.5 | 4.8 | 5.1 | 5.4 | 5.3 | 5.2 | 4.5 | 4.3 | 4.1 |
| Radio and TV receiving equipment | 365 366 367 367-64,369 | 3.3 6.7 2.3 2.3 | 2.9 7.2 6.6 2.6 | 3.7 5.1 6.6 2.2 | 4.3 5.4 2.0 2.0 | 3.5.2 9.2.2 2.2.2 | 3.2 5.5 8.5 2.6 | 2.4 6.1 2.3 2.3 | 1.8 6.8 7.7 2.3 | 1.6 6.1 7.4 2.2 | 1.0 (S) 7.2 2.2 | 0.7 7.1 7.2 2.2 |
| Transportation equipment | 37 | N/A | N/A | 3.3 | 3.4 | 3.6 | 3.4 | 3.5 | 3.5 | 3,4 | 4.0 | 4.1 |
| Motor vehicles and motor vehicles equipment Other transportation equipment | 373-75,379 372,376 | 4.0 0.7 5.1 | 3.5 | 3.0 0.2 0.4 | 3.1 3.9 3.9 | 3.3 2.7 4.0 | 8. 2. 8. 4. 6. | 3.4 3.9 3.9 | 3.7 2.5 3.3 | 8.2.8. 7.1.8. | 1.2.4 1.0.4 | 4.0 (S) 4.6 |
| | | | | | | | | | | | | |

See explanatory information and SOURCE at end of table.

Table A-18. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982-92

| Page 2 of 2 | 1992 | 7.2 | 6.2 | 8.2 | 1.0 | | | 2 6 6 | 9.6 |
|-------------|------------------------------|---|--|---|-----------------------------------|--|--|--|----------------|
| | 1991 | 7.1 | 6.3 | 8.0 | 0.8 | | 8. 2. c | , 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5 | 3.8 |
| | 1990 | 7.1 | 6.9 | 7.5 | 6.0 | | 3.3 | 2.8 | 3.6 |
| | 1989 | 6.8 | 6.9 | 7.1 | 6.0 | | 3.5 | 2.1 | 3.7 |
| | 1988 | 7.1 | 7.6 | 7.1 | 1.0 | | 7.1 | 2.0 | 3.7 |
| | 1987 | 7.5 | 8.1 | 7.2 | 1:1 | | 3.8 2.2 7.4 | 2.0 | 3.8 |
| | 1986 | 8.2 | 8.4 | 8.0 | 1.2 | | 0.2.2 | 2.0 | 3.7 |
| | 1985 | 8.3 | 8.4 | 8.1 | 1.0 | | 8.5.5 4.5.5 4.5.4 | 2.5 | 3.5 |
| | 1984 | 7.6 | 8.3 | 7.3 | 1. | | 2.2 | 1.6 | 3.2 |
| | 1983 | 7.7 | 8.8 | 7.1 | 1.0 | | 2.2 N/A | 1.3 | 3.4 |
| | 1982 | 7.3 | 7.6 | 7.1 | 0.8 | | 1.6 N/A | 1.5 | 3.3 |
| | SIC code | 38 | 381-82 | 384-87 | 27,31,39 | | | | |
| | Industry and size of company | Professional and scientific instruments | Scientific and mechanical measuring instruments. | Optical, surgical, priotographic, and other instruments | Other manufacturing industries 1/ | Distribution by size of company [Based on number of employees] | Fewer than 500 2/. 500 to 999 3/. 1.000 to 4.999 | 5,000 to 9,999 | 25,000 or more |

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries." 2/ Data for 1982-83 are for companies with fewer than 1,000 employees. 3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

(S) = Data have been withheld because of imputation of more than 50 percent. N/A = Not available KEY:

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

Table A-19. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies by industry and ranked by size of R&D program: 1992

| | , | | | | | | Page 1 of 1 |
|---|----------------|-------------------|---------------------------------|-------------------|-------------------|-------------------|-------------------|
| | | | otal R&D fund percent of net | | Т | otal R&D fund | S |
| Industry | SIC code | | [Percent] | | [D | ollars in millior | ns] |
| | | First 4 companies | Next 4 companies | Next 12 companies | First 4 companies | Next 4 companies | Next 12 companies |
| Total | | 8.1 | 7.0 | 16.4 | \$18,792 | \$9,758 | \$15,334 |
| Food, kindred, and tobacco products | 20.21 | 1.2 | 0.4 | 0.5 | 688 | 157 | 231 |
| Textiles and apparel | 22,23 | 0.9 | 0.9 | 0.9 | 90 | 44 | 67 |
| Lumber, wood products, and furniture | 24,25 | 2.5 | 0.7 | 0.8 | 91 | 35 | 30 |
| Paper and allied products | 26 | 3.2 | 0.9 | 0.6 | 828 | 158 | 129 |
| Chemicals and allied products | 28 | 11.2 | 8.6 | 9.4 | 3,745 | 2,642 | 4,261 |
| Industrial chemicals | 281-82,286 | 6.7 | 5.5 | 3.9 | 2,811 | 885 | 1,051 |
| Drugs and medicines | 283 | 17.8 | 9.4 | 11.8 | 3,307 | 1,959 | 2,621 |
| Other chemicals | 284-85,287-89 | 5.0 | 2.3 | 3.0 | 1,224 | 341 | 377 |
| Details and extraction | 13,29 | 1.5 | 0.9 | 0.5 | 1.333 | 519 | 391 |
| Petroleum refining and extraction | 30 | 4.9 | (S) | 2.2 | 539 | (S) | 153 |
| Stone, clay, and glass products | 32 | 3.3 | 1.7 | 1.8 | 375 | 106 | 60 |
| Primary metals | 33 | 0.6 | 1.3 | 0.8 | 196 | 83 | 131 |
| rilliary metals | | | | | | | 4.4 |
| Ferrous metals and products | 331-32,3398-99 | 0.5 | | 0.8 | 109 | 44 | 44 |
| Nonferrous metals and products | 333-36 | (S) | 0.8 | 0.6 | (S) | 57 | 55 |
| Fabricated metal products | 34 | 4.2 | 1.2 | 1.1 | 386 | 107 | 133 |
| Machinery | 35 | 18.3 | 12.0 | 9.8 | 8,042 | 1,476 | 1,865 |
| | 357 | 18.3 | 21.0 | 8.9 | 8,042 | 1,219 | 1,341 |
| Office, computing, and accounting machines | 351-56,358-59 | 5.9 | 5.2 | 4.3 | 973 | 365 | 472 |
| Other machinery, except electrical | 331-36,336-33 | | | | | | |
| Electrical equipment | 36 | 7.9 | 16.1 | 7.9 | 5,757 | 1,882 | 1,688 |
| Radio and TV receiving equipment | 365 | 0.6 | 4.4 | 1.7 | 70 | 11 | 12 |
| Communication equipment | 366 | 11.9 | 8.3 | 11.4 | 3,357 | 674 | 398 |
| Electronic components | 367 | 10.0 | 10.5 | 11.4 | 1,440 | 397 | 538 |
| Other electrical equipment | 361-64,369 | (D) | 2.0 | 2.1 | (D) | 246 | 264 |
| Transportation equipment | 37 | 7.1 | 15.2 | 10.1 | 13,822 | 6,070 | 4,885 |
| Mater vehicles and mater vehicles equipment | 371 | (D) | 1.0 | 0.8 | (D) | 186 | 122 |
| Motor vehicles and motor vehicles equipment Other transportation equipment | 373-75,379 | (D) | 0.7 | 0.9 | (D) | 19 | 15 |
| Aircraft and missiles | 372,376 | 15.1 | 13.2 | 9.4 | 8,425 | 4,651 | 2,866 |
| Professional and scientific instruments | 38 | 11.2 | 11.4 | 12.6 | \$4,041 | \$1,748 | \$1,242 |
| Scientific and mechanical measuring instruments | 381-82 | 13.9 | 10.1 | 13.4 | 3,024 | 556 | 567 |
| Optical, surgical, photographic, and other | | | | | | | |
| instruments | 384-87 | 9.2 | 8.5 | 6.9 | 2,710 | 333 | 346 |
| Other manufacturing industries | 27,31,39 | 4.9 | 3.0 | 1.1 | 254 | 69 | 74 |

KEY:

NOTE: Rankings were based on total (company, Federal, and other) R&D funds.

⁽D) = Data have been withheld to avoid disclosing operations of individual companies. (S) = Data have been withheld because of imputation of more than 50 percent.

Table A-20. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and ranked by size of company-financed R&D program: 1992

Page 1 of 1 Company R&D funds Company R&D funds SIC code Industry [Percent] [Dollars in millions] First 4 Next 4 Next 12 First 4 Next 4 Next 12 companies companies companies companies companies companies 6.9 3.6 10.7 \$15,391 (S) (S) Food, kindred, and tobacco products..... 20,21 1.0 (S) 0.0 688 231 (S) Textiles and apparel.....Lumber, wood products, and furniture..... 22,23 1.0 ì.ó 1.0 44 66 24,25 2.0 1.0 1.0 30 29 Paper and allied products..... 26 3.0 (S) 1.0 778 (S) 129 Chemicals and allied products..... 28 11.2 3,730 2,643 4.236 Industrial chemicals..... 281-82,286 7.0 4.0 4.0 2,797 692 1,008 Drugs and medicines..... 1,958 (S) 12.0 2,620 284-85,287-89 Other chemicals..... 1,224 3.0 319 376 Petroleum refining and extraction..... 13,29 2.0 1.0 1,326 1.0 518 391 Rubber products. (S) (S) (S) (S (S) Stone, clay, and glass products..... 2.0 2.0 266 105 57 Primary metals. 33 0.6 0.8 193 78 131 Ferrous metals and products..... 331-32,3398-99 0.0 1.0 108 44 44 Nonferrous metals and products..... 333-36 (S) 1.0 1.0 (S) 55 51 Fabricated metal products..... 2.0 1.0 169 121 Machinery.. 35 16.3 11.9 7,174 1,466 1,835 Office, computing, and accounting machines..... 357 16.3 1,337 (S) 9.0 7.174 (S) Other machinery, except electrical..... 351-56,358-59 (S) 4.0 320 (S) 472 Electrical equipment..... 36 5.3 8.3 5.0 3,642 1,033 1,316 Radio and TV receiving equipment..... 365 1.0 4.0 2.0 69 12 Communication equipment..... 366 8.0 (S) 666 11.0 (S)398 Electronic components..... 367 10.0 (S) 10.0 (S) 389 492 Other electrical equipment..... 361-64,369 (D) (S) 2.0 (S) 255 Transportation equipment 37 5.6 (S) 11,385 2.4 (S) 1,173 Motor vehicles and motor vehicles equipment..... 371 (D) 1.0 0.8 186 118 Other transportation equipment..... 373-75.379 (S) (S) 0.9 (S) 15 Aircraft and missiles 372,376 (D) (S) (S) (S)(S) Professional and scientific instruments..... 38 8.7 7.2 8.4 \$3,150 \$836 \$1,062 Scientific and mechanical measuring instruments..... 381-82 6.0 6.7 (S) 1308 368 (S) Optical, surgical, photographic, and other instruments..... 384-87 9.0 8.5 6.9 2646 333 345 Other manufacturing industries..... 27,31,39 3.0 1.1 241 69 73

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: Rankings were based upon company and other (except Federal) R&D funds.

Table A-21. Federal R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and ranked by size of federally financed R&D program: 1992

Page 1 of 1 Federal R&D funds Federal R&D funds [Dollars in millions] [Percent] Industry SIC code First 4 Next 4 Next 12 First 4 Next 4 Next 12 companies companies companies companies companies companies \$5,527 \$5,957 \$3,461 8.4 2.2 7.4 0 0.0 0.0 0.0 0 0 20.21 Food, kindred, and tobacco products..... 22.23 0.0 0.0 (S) 0 0 (S) Textiles and apparel..... (D) 0 0 0.0 (D) 0.0 24.25 Lumber, wood products, and furniture..... 0.0 (D) 0 0 ÌΒί 0.0 Paper and allied products..... 26 (S) (S) 14 0.0 Chemicals and allied products..... 28 (S) (S) 9 5 0.0 (D) (D) 0.0 281-82,286 Industrial chemicals..... (D) (S) 0.0 (D) (S) Drugs and medicines..... (S) Ó 284-85,287-89 (D) (S) 0.0 (D) Other chemicals..... 0 0.0 0.0 8 13,29 Petroleum refining and extraction..... 30 (D) 0.0 0.0 (D) 0 0 Rubber products. (D) 0.0 0.0 (D) n 32 Stone, clay, and glass products..... 3 0 0.0 0.0 33 (S) Primary metals.... (D) 0 0 (D) 0.0 0.0 Ferrous metals and products..... 331-32,3398-99 (S) 0 0.0 Nonferrous metals and products..... 333-36 (S) 0.0 45 2 5.0 1.0 1.0 246 Fabricated metal products..... 34 47 (D) 62 0.5 0.4 35 (D) Machinery... 0.0 (D) (D) n (D) (D) Office, computing, and accounting machines...... 357 78 (S) Other machinery, except electrical..... 351-56,358-59 0.0 (S 1.0 358 193 10.6 1.3 3,241 36 5.3 Electrical equipment..... 0 (D) 0.0 0.0 (D) 365 Radio and TV receiving equipment..... 21.0 1.0 (D) 14 366 (D) Communication equipment..... 25 25 195 2.0 367 3.0 3.0 Electronic components..... 30 6 361-64,369 (D) 1.0 0.0 (D) Other electrical equipment..... 2,790 2,584 (S) 8.2 37 (S) 1.8 Transportation equipment..... 0 Motor vehicles and motor vehicles equipment...... 0.0 0.0 371 0.0 0.0 (D) 0 373-75,379 Other transportation equipment...... 2.677 (S) (S) (S) 372,376 (S) Aircraft and missiles... \$168 \$305 1.5 3.8 \$1,728 38 9.4 Professional and scientific instruments..... 137 2.9 1728 272 381-82 9.4 4.6 Scientific and mechanical measuring instruments... Optical, surgical, photographic, and other (D) (D) 0.4 (D) (D) 3 384-87 27,31,39 (D) 0.0 74 (D) 0 2.8 Other manufacturing industries.....

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: Rankings were based upon Federal R&D funds.

Table A-22. Total (company, Federal, and other) funds for performance of basic research, applied research, and development, in current and in constant dollars: 1953-92

Page 1 of 1

| | | | | | | | | Page 1 of 1 |
|---------|--------------------|-----------------------------|--------------------|-----------------------------|--------------------|-----------------------------|--------------------|-----------------------------|
| | Tota | al | Basic res | search | Applied re | esearch | Develop | ment |
| Year | Current dollars | Constant 1987 dollars | Current dollars | Constant 1987 dollars | Current dollars | Constant 1987 dollars | Current dollars | Constant 1987 dollars |
| 1953 1/ | \$3,630 | \$16,500 | \$151 | \$686 | \$726 | \$3,300 | \$2,753 | \$12,514 |
| 1954 1/ | 4,070 | 18,333 | 166 | 748 | 814 | 3,667 | 3,090 | 13,919 |
| 1955 1/ | 4,640 | 20,262 | 189 | 825 | 928 | 4,052 | 3,523 | 15,384 |
| | 6.605 | 27,987 | 253 | 1.072 | 1,268 | 5,373 | 5.084 | 21,542 |
| 1956 | | 31,684 | 271 | 1,111 | 1,670 | 6,844 | 5,790 | 23,730 |
| 1957 | 7,731 8,389 | 33,691 | 295 | 1,185 | 1,911 | 7.675 | 6.183 | 24,831 |
| 1958 | | , | | ., | | , | | 28,543 |
| 1959 | 9,618 | 37,570 | 320 | 1,250 | 1,991 | 7,777 | 7,307 | 26,343 |
| 1960 | 10,509 | 40,419 | 376 | 1,446 | 2,029 | 7,804 | 8,104 | 31,169 |
| 1961 | 10,908 | 41,475 | 395 | 1,502 | 1.977 | 7,517 | 8,537 | 32,460 |
| 1962 | 11,464 | 42,617 | 488 | 1,814 | 2,449 | 9,104 | 8,527 | 31.699 |
| 1963 | 12,630 | 46,434 | 522 | 1,919 | 2,457 | 9,033 | 9,651 | 35.482 |
| 1964 | 13,512 | 48,780 | 549 | 1,982 | 2,600 | 9,386 | 10,363 | 37,412 |
| | | | | | | | | |
| 1965 | 14,185 | 49,947 | 592 | 2,085 | 2,658 | 9,359 | 10,935 | 38,504 |
| 1966 | 15,548 | 52,884 | 624 | 2,122 | 2,843 | 9,670 | 12,081 | 41,092 |
| 1967 | 16,385 | 54,076 | 629 | 2,076 | 2,915 | 9,620 | 12,841 | 42,380 |
| 1968 | 17,429 | 54,808 | 642 | 2,019 | 3,124 | 9,824 | 13,663 | 42,965 |
| 1969 | 18,308 | 54,814 | 618 | 1,850 | 3,287 | 9,841 | 14,403 | 43,123 |
| 1970 | 18,067 | 51,327 | 602 | 1,710 | 3,427 | 9,736 | 14,038 | 39,881 |
| 1971 | 18,320 | 49,380 | 590 | 1,590 | 3,415 | 9,205 | 14,315 | 38,585 |
| 1972 | 19,552 | 50,392 | 593 | 1,528 | 3,514 | 9,057 | 15,445 | 39,807 |
| 1973 | 21,249 | 51,450 | 631 | 1,528 | 3,825 | 9,262 | 16,793 | 40,661 |
| 1974 | 22,887 | 50,973 | 699 | 1,557 | 4,288 | 9,550 | 17,900 | 39,866 |
| 1074 | 22,007 | 00,070 | 000 | 1,007 | 1,200 | 3,000 | 17,000 | 00,000 |
| 1975 | 24,187 | 49,161 | 730 | 1,484 | 4,570 | 9,289 | 18,887 | 38,388 |
| 1976 | 26,997 | 51,620 | 819 | 1,566 | 5,112 | 9,774 | 21,066 | 40,279 |
| 1977 | 29,825 | 53,354 | 911 | 1,630 | 5,636 | 10,082 | 23,278 | 41,642 |
| 1978 1/ | 33,304 | 55,231 | 1,035 | 1,716 | 6,300 | 10,448 | 25,969 | 43,066 |
| 1979 | 38,226 | 58,271 | 1,158 | 1,765 | 7,225 | 11,014 | 29,843 | 45,492 |
| 1980 1/ | 44,505 | 62,071 | 1,325 | 1,848 | 8,450 | 11,785 | 34,730 | 48,438 |
| 1981 | 51,810 | 65,665 | 1,614 | 2,046 | 10,699 | 13,560 | 39,497 | 50,060 |
| 1982 1/ | 58,650 | 69,988 | 1,904 | 2,272 | 12,323 | 14,705 | 44,423 | 53,011 |
| 1983 | 65,268 | 74,849 | 2,223 | 2,549 | 13,927 | 15,971 | 49,118 | 56,328 |
| 1984 | 74,800 | 82,198 | 2,608 | 2,866 | 15,765 | 17,324 | 56,427 | 62,008 |
| 1005 | 24.005 | 20.000 | 0.000 | 0.000 | 40.055 | 40.000 | 00.400 | 00.007 |
| 1985 | 84,239 | 89,236 | 2,862 | 3,032 | 18,255 | 19,338 | 63,122 | 66,867 |
| 1986 | 87,823 | 90,633 | 4,047 | 4,176 | 19,759 | 20,391 | 64,031 | 66,079 |
| 1987 | 92,155 | 92,155 | 4,324 | 4,324 | 19,813 | 19,813 | 68,016 | 68,016 |
| 1988 | 97,015 | 93,373 | 4,500 | 4,331 | 20,748 | 19,969 | 71,767 | 69,073 |
| 1989 | 102,055 | 94,060 | 5,216 | 4,807 | 22,691 | 20,913 | 74,148 | 68,339 |
| 1990 | 109,727 | 96,846 | 5,128 | 4,526 | 24,785 | 21,876 | 79,814 | 70,445 |
| 1991 | 116,952 | 99,449 | 9,423 | 8,013 | 26,172 | 22,255 | 81,357 | 69,181 |
| 1992 | 121,314 | 100,342 | 9,794 | 8,101 | 27,175 | 22,477 | 84,345 | 69,764 |
| | | | | | | | | |
| | | | | | | | | |

^{1/} Character-of-work estimates were made by the National Science Foundation. See: National Science Foundation, National Patterns of R&D Resources: 1990, Final Report, NSF 90-316.

NOTES: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change. The 1987 GNP implicit price deflator was used to convert current dollars to constant dollars.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Research and Development in Industry: 1992

Table A-23. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1988

| | | | | | | | | | | | | ď | Page 1 of 2 |
|--|-------------------------------------|------------------------------------|-------------------------|--------------------------------------|-------------------------|------------------------------|-------------------------------------|--------------------------|---------------------------|----------------------------------|--|--|----------------------------------|
| Distribution by industry | SIC code | | Total | | | Basic | | | Applied | | Ω | Development | |
| | | Total | Federal | Company | Total | Federal | Company | Total | Federal | Company | Total | Federal | Company |
| | | | | | | | [Dol] | [Dollars in millions] | | | | | |
| Total | | \$97,015 | \$30,343 | \$66,672 | \$4,500 | \$993 | \$3,507 | \$20,748 | \$4,217 | \$16,531 | \$71,767 | \$25,133 | \$46,634 |
| Food, kindred, and tobacco products | 20,21 22,23 24,25 26 26 | (D) (D) (D) (D) 11,067 | 3999 | 1,173 215 165 752 10,828 | (D) (D) 58 841 | 0 (C) 0 4 <u>+</u> | (D) (D) (S) 58 827 | (D) 53 53 4,366 | 0 0 0 (D) 129 | (D) (D) 53 269 4,237 | (D) (D) (D) 425 425 5,860 | (a) (a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c | 711 179 86 425 5,764 |
| Industrial chemicals | 281-82,286 283 284-85,287-89 | 4,906 1,989 | 231 | 3,939 4,900 1,989 | 313 (S) 33 | 400 | 299 (S) | (D) 704 | (a) (a) (b) | 1,520 2,013 704 | (D) 1,252 | <u>©</u> ©° | 2,120 2,392 1,252 |
| Petroleum refining and extraction | 13,29 30 32 32 33 | (D) (D) (D) 637 | 22 (D) (D) | 1,975 718 697 620 | (D) 65 138 75 | (D) | 78 65 138 75 | 0000 | <u> </u> | 1,013 147 (S) 221 | 898 (D) 193 (D) | 4 (O) (O) | 884 506 193 324 |
| Ferrous metals and products | 331-32,3398-99 | 253 384 | 16 | 252 368 | 3 72 | 0 | 3 72 | 00 | (a) (a) | 124 | <u>0</u> 0 | <u>0</u> 0 | 125 199 |
| Fabricated metal products | 34 | 881 (D) | 163 (D) | 718 | 58 (D) | ° (<u>a</u> | 58 242 | <u>(2)</u> | <u>Q</u> Q | 169 2,043 | <u>0</u> 0 | <u>0</u> 0 | 491 9,644 |
| Office, computing, and accounting machines Other machinery, except electrical | 351-56,358-59 | (D) 2,682 | (D) 100 | 9,347 | (S) | <u>Q</u> | 163 (S) | <u>(2)</u> | (Q) (Q) | 1,579 | <u>0</u> 0 | 00 | 7,605 2,039 |
| Electrical equipment | 36 | 14,128 | 1,453 | 9,975 | 594 | 21 | 573 | 3,317 | 640 | 2,677 | 10,217 | 3,492 | 6,725 |
| Radio and TV receiving equipment | 365 366 367 361-64,369 | 149 8,427 4,133 1,419 | 0 3,630 449 74 | 149 4,797 3,684 1,345 | 0000 | ° (<u>()</u> (<u>()</u> () | <u>©</u> <u>©</u> <u>©</u> <u>©</u> | (D) 1,883 236 | ° (j) (j) ° | (D) 676 (D) 236 | (D) 7,021 (D) 1,015 | (D) (D) 74 | (D) 1,831 941 |
| Transportation equipment | . 37 | 34,775 | 20,865 | 13,910 | 453 | 243 | 210 | 3,741 | 1,937 | 1,804 | 30,581 | 18,685 | 11,896 |
| Motor vehicles and motor vehicles equipment | 373-75,379 372,376 | (D) (D) 24,168 | (D) (D) 18,402 | 7,783 361 5,766 | 101 (S) 342 | 0 0 243 | 101 (S) 99 | (D) 2,809 | (D) (D) 1,773 | (D) 1,036 | (D) (D) 21,017 | (D) (D) 16,386 | (D) (D) 4,631 |
| | | | | | | | | | | , | | | |

See explanatory information and SOURCE at end of table.

Table A-23. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1988

| Page 2 of 2 | ent | al Company | | \$143 \$3,717 | (D) 1,381 | (D) 2,336 | 3 287 1,590 4,802 | |
|-------------|--------------------------|------------|-----------------------|---------------------------------------|---|--|--------------------------------|---|
| | Development | Federal | | ₩ | | | Ψ, | |
| | ۵ | Total | | \$3,860 | (D) | (a) | 290 6,392 | |
| _ | | Company | : | \$1,132 | 308 | 824 | 1,904 | |
| | Applied | Federal | | (D) | (D) | (Q) | 964 | |
| | | Total | [Dollars in millions] | (D) | <u>Q</u> | (<u>D</u>) | 55 2,868 | |
| | | Company | [Dollar | \$490 | 174 | 316 | (S) 551 | |
| | Basic | Federal | | (a) | 0 | (D) | 702 | |
| | | Total | | <u>(</u>) | 174 | (D) | (S) 1,253 | |
| | | Company | | \$5,339 | 1,863 | 3,476 | 401 | |
| | Total | Federal | | \$191 | (S) | 96 | (D) 3,256 | |
| | | Total | | \$5,530 | 1,959 | 3,571 | (D) 10,513 | |
| | SIC code | | | 38 | 381-82 | 383-87 | 27,31,39 | 42,44-51,53-54, 56,60,62-63,72- 73,78.806-07,87 |
| | Distribution by industry | | | Professional and Scientific Equipment | Scientific and mechanical measuring instruments | Optical, surgical, photographic, and otner instruments | Other manufacturing industries | |

⁽D) = Data have been withheld to avoid disclosing operations of individual companies. (S) = Data have been withheld due to imputation of more than 50 percent. KEY:

NOTE: The character-of-work estimation procedure was revised for 1986 and later years: hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-24. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1989

| | | | | | | | | | | | | | Page 1 of 2 |
|-------------------------------------|----------------------------|------------------------------------|--|--------------------------------------|--------------------------------|---------------|-------------------------------|--------------------------------|---|-------------------------------------|-----------------------------------|-------------------------------|-----------------------------------|
| SIC code | σ. | | Total | | | Basic | | | Applied | | | Development | ÷ |
| | | Total | Federal | Company | Total | Federal | Company | Total | Federal | Company | Total | Federal | Company |
| | 1 | | | | | | [Dollars in millions] | millions] | | | | | |
| | | \$102,055 | \$28,554 | \$73,501 | \$5,216 | \$1,384 | \$3,832 | \$22,691 | \$4,698 | \$17,993 | \$74,148 | \$22,472 | \$51,676 |
| 20,21 22,23 24,25 26 26 | 23 25 26 28 28 | (D) (D) 192 879 12,069 | (D) (D) 126 | 1,244 (S) 192 879 11,943 | (S) (D) (D) 58 945 | 00006 | (S) (D) (D) 58 58 | (D) 26 (D) 0 4,763 | (O) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 437 26 (D) 0 0 4,744 | (D) 175 167 821 6,361 | (D) (D) 0 0 78 | 729 (D) 167 821 6,274 |
| 281-82,286 283 284-85,287-89 | 286 283 7-89 | 4,451 (D) (D) | <u> 5</u> <u>0</u> 0 | 4,340 5,512 2,091 | 373 (S) 56 | 600 | 353 (S) (S) | <u> </u> | <u> </u> | 1,681 2,263 800 | <u>0</u> 00 | 999 | 2,306 2,732 1,236 |
| 13,29 30 32 33 33 | 33233 | 2,180 (D) (D) 688 | 7 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 | 2,162 867 615 666 | (D) (D) 82 | (a) (a) (a) | 111 60 130 82 | 0000 | <u> </u> | 1,033 159 298 225 | 1,037 (0) (0) (0) | \$ <u>0</u> <u>0</u> <u>0</u> | 1,019 648 187 358 |
| 331-32,3398-99 333-36 | | <u>@</u> @ | 00 | 244 | <u>©</u> | 00 | <u></u> <u> </u> | <u>ê</u> ê | <u>0</u> 0 | <u>Q</u> Q | <u>0</u> 0 | <u>0</u> 0 | 128 230 |
| 34 | | 904 (D) | 178 (D) | 13,342 | 49 (D) | (a) | 49 (S) | <u>ê</u> ê | <u>ê</u> ê | 187 2,764 | 00 | <u> </u> | 490 10,312 |
| 357 351-56,358-59 | | (D) 2,729 | (D) | 10,725 | (D) 91 | (a) | (S) 91 | <u>0</u> 0 | <u>0</u> 0 | 2,311 | (D) 2,153 | (D) 80 | (S) 2,073 |
| 36 | | 13,318 | 3,743 | 9,576 | (D) | (D) | 514 | <u>Q</u> | <u>a</u> | 2,412 | 9,549 | 2,899 | 6,650 |
| 365 366 367 367-64,369 | 10 10 10 10 | 96 7,071 4,025 2,127 | 2,911 369 463 | 96 4,160 3,655 1,664 | <u>0</u> 000 | 0 (D) | (a) (b) (a) (b) | 33(0) | 0 (8) (1) | (D) 1,638 335 | (D) 5,711 (D) 1,587 | 2,191 (0) (0) | (D) 3,520 1,938 (D) |
| 37 | _ | 33,858 | 19,262 | 14,596 | 099 | 474 | 186 | 3,826 | (D) | (a) | 29,372 | (D) | (D) |
| 373-75,379 372,376 372,376 | 100 | (D) (D) 22,331 | (D) (D) 16,828 | 8,756 337 5,503 | 81 6 573 | 0 0 474 | 81 (S) 99 | (D) (D) 2,736 | (D) 0 1,811 | (D) 925 | (D) (D) 19,021 | (D) (D) 14,543 | (D) (D) 4,478 |
| | 1 | | | | | | | | | | | | |

See explanatory information and SOURCE at end of table.

Table A-24. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1989

| | | | | | | | | | | | | | Page 2 of 2 |
|--|---|---------------|--------------|---------------|--------------|----------|-----------------------|-------------|--------------|-------------|--------------|-------------|--------------|
| Distribution by industry | SIC code | | Total | | | Basic | | | Applied | | | Development | ŧ |
| | | Total | Federal | Company | Total | Federal | Company | Total | Federal | Company | Total | Federal | Company |
| | | | | | | | [Dollars in millions] | millions] | | | | | |
| Professional and Scientific Equipment | 38 | \$5,992 | \$263 | \$5,729 | (a) | (D) | \$440 | \$1,450 | \$178 | \$1,272 | (D) | (D) | \$4,017 |
| Scientific and mechanical measuring instruments | 381-82 | 2,366 | (S) | 2,204 | (S) | 0 | (S) | (a) | (<u>a</u>) | 449 | 1,612 | 0 | 1,612 |
| Optical, surgical, photographic, and other instruments | 383-87 | 3,626 | 101 | 3,525 | (a) | (a) | 296 | (a) | (D) | 823 | <u>a</u> | (D) | 2,405 |
| Other manufacturing industries | 27,31,39 10-11,14-17,40- | (D) 14,031 | (D) 3,729 | 438 10,302 | (S) 1,697 | 0 858 | (S) 839 | 99 3,687 | 1,159 | 66 2,528 | 337 8,647 | 1,712 | 328 6,935 |
| | 42,44-31,33-34, 56,60,62-63,72- 73,78,806-07,87 | | | | | | | | | | | | |

⁽D) = Data have been withheld to avoid disclosing operations of individual companies. (S) = Data have been withheld due to imputation of more than 50 percent. KEY:

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-25. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1990

| Industry | SIC code | | Total | | | Basic | | | Applied | | | Development | |
|--|---|--------------------------------|-------------------------------------|--|-------------------|--|--------------------------|---|---|----------------------------------|-----------------------------------|----------------------|-----------------------------------|
| | | Total | Federal | Company | Total | Federal | Company | Total | Federal | Company | Total | Federal | Company |
| | | | | | | | [Dollars i | Dollars in millions] | | | | | |
| Total. | | \$109,727 | \$28,125 | \$81,602 | 5,128 | 1,368 | 3,760 | 24,785 | 6,353 | 18,432 | 79,814 | 20,404 | 59,410 |
| Food, kindred, and tobacco products | 20,21 22,23 24,25 26 26 28 | (D) 216 1,059 13,291 | (D) 0 0 123 123 | 1,248 260 216 1,059 13,168 | 00000 | (a) (b) (c) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d | (S) | 406 43 (D) (D) 5,369 | 0 - 0 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 | 406 42 (D) (D) 5,319 | 692 189 109 725 6,987 | 0 8 0 0 8 | 692 181 109 725 6,922 |
| Industrial chemicals | 281-82,286 283 284-85,287-89 | 5,010 (D) (D) | 00 00 00 00 | 4,902 5,917 2,349 | 366 (S) (S) | (g) 0 | 358 (S) (S) | <u></u> <u> </u> | <u>0</u> 00 | 000 | (D) 1,507 | <u>0</u> 0° | (D) (D) 1,507 |
| Petroleum refining and extraction | 13,29 30 32 33 | 2,306 (D) (D) (D) | <u>©</u> <u>O</u> <u>O</u> <u>O</u> | 2,289 1,056 538 717 | (D) 117 (S) | <u>©°</u> <u>©</u> ° | (D) 117 207 (S) | 1,042 (D) (D) | ° (2) (2) | 1,034 (D) (D) | 38(0,0) | 999 | (D) (D) 375 |
| Ferrous metals and products | 331-32,3398-99 | <u>0</u> 0 | 00 | 231 486 | 00 | 0 0 | 99 | 00 | <u>0</u> 0 | <u>0</u> 0 | 112 275 | | 111 |
| Fabricated metal products | 34 | 939 14,446 | 203 871 | 736 13,575 | 64 (D) | 14 (D) | (D) | 235 (D) | 51 (D) | 184 (D) | 640 (D) | 138 (D) | 502 10,656 |
| Office, computing, and accounting machines | 357 351-56,358-59 | 00 | <u>@@</u> | 10,988 | <u>0</u> 0 | <u>ê</u> ê | <u>0</u> 0 | <u>©</u> © | 99 | <u>0</u> 0 | 9,199 (D) | 594 (D) | 8,606 2,051 |
| Electrical equipment | 36 | 13,400 | 4,133 | 9,267 | 422 | 130 | 292 | 3,646 | 1,124 | 2,521 | 9,332 | 2,879 | 6,453 |
| Radio and TV receiving equipment | 365 366 367 367-64,369 | 114 5,928 3,914 3,445 | 2,344 418 1,371 | 3,584 3,496 2,074 | 25(†) 25(†) | 0000 | <u>3</u> 000 | (C) | (D) 0 290 | 0008 | 76 4,607 2,184 2,465 | 1,665 233 981 | 76 2,942 1,951 1,484 |
| Transportation equipment | . 37 | 31,361 | 17,097 | 14,264 | 654 | 416 | 238 | <u>(D</u> | (D) | 1,799 | (a) | (a) | 12,157 |
| Motor vehicles and motor vehicles equipment Other transportation equipment | 373-75,379 372,376 | (D) (D) 20,635 | (D) (D) 15,248 | 8,594 283 5,387 | 110 8 536 | 18 2 396 | 92 6 | 976 (D) 2,718 | (D) 0 2,009 | (D) (D) 710 | (D) (D) 17,382 | (D) (D) 12,843 | (D) (D) 4,537 |
| | | | | 4 | · · | | | | | | | | |

See explanatory inforamtion and SOURCE at end of table.

Table A-25. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1990

| raye z ul z | Company | | \$4,478 | 2,066 | 2,412 | 385 10,245 |
|-------------|----------|-----------------------|---|---|--|--|
| Development | Federal | | (a) | 498 | <u>Q</u> | 2,783 |
| | Total | | (D) | 2,564 | (a) | 13,029 |
| | Company | | \$1,347 | 543 | 804 | 4,085 |
| Applied | Federal | | \$158 | (Q) | (D) | 1,110 |
| | Total | nillions] | \$1,505 | Q) | <u>(a)</u> | 5,195 |
| | Company | [Dollars in millions] | \$389 | 104 | 285 | 2,021 |
| Basic | Federal | | (Q) | (a) | (a) | 549 |
| | Total | | (D) | (a) | <u>(a)</u> | 2,569 |
| | Company | | \$2,696 | 2,696 | 3,621 | 541 |
| Total | Federal | | \$650 | (S) | 88 | (D) 4,442 |
| | Total | | \$7,055 | 3,346 | 3,709 | (D) 20,793 |
| | SIC code | | 36 | 381-82 | 383-87 | 27,31,39 10-11,14-17,40- 42,44-51,53-54, 56,60,62-63,72- 73,78,806-07,87 |
| | Industry | | Professional and scientific instruments | Scientific and mechanical measuring instruments | Optical, surgical, protographic, and other instruments | Other manufacturing industries |

(D) = Data have been withheld to avoid disclosing operations of individual companies. (S) = Data have been withheld due to imputation of more than 50 percent. KEY:

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

Table A-26. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1991

| Development | Federal Company | | \$18,231 \$63,126 | 0 687 15 170 (D) 107 0 527 88 7,959 | 66 3,227 (D) 3,374 (D) 1,358 | (D) 242 (D) 242 (D) 323 | (D) 105 (D) 218 | (D) 539 (D) 11,246 | (D) 8,880 121 2,366 | | 2,916 5,970 | | \ |
|-------------|--------------------------|-----------------------|-------------------|---|------------------------------------|-----------------------------------|-----------------------------|---------------------------|--|----------------------|-------------|---|--|
| ۵ | Total | | \$81,357 | 687 185 (D) 527 8,047 | 3,293 (D) (D) | 1,267 (D) (D) | <u>@</u> @ | <u>0</u> 0 | (D) 2,487 | | 8,886 | 8,886 (D) (D) (D) | 8,886 (D) (D) (D) (D) 23,829 |
| | Company | | \$20,984 | 478 38 74 (D) 4,802 | 1,371 2,654 777 | 961 390 163 (S) | (S) | 156 | 1,319 | | 2,618 | 2,618 8 879 791 940 | 2,618 8 879 791 940 |
| Applied | Federal | - | \$5,188 | 0 (0) (0) (0) | 9 | (a) (a) | <u>0</u> 0 | 00 | (D) | | <u>(a)</u> | <u>0</u> 0 0 0 0 0 | (D) (S) (D) (D) |
| | Total | nillions] | \$26,172 | 478 (D) 74 (D) 4,906 | (D) 793 | (0) (0) (0) (0) | 00 | 00 | (D) 818 | ξ | () | g (C) 8 (C) | (D) (D) 841 (D) 2,876 |
| | Company | [Dollars in millions] | \$6,470 | 112 28 21 (D) 1,678 | 627 919 132 | 265 (D) 51 (S) | 00 | 53 375 | 220 | 276 | | 8 60 118 90 | 60 118 90 212 |
| Basic | Federal | | \$2,953 | (D) 0 17 | 000 | <u></u> | 00 | 0 (0) | <u>@</u> @ | (Q) | | ° (2) (2) | . (9) (9) (9) (9) (9) (9) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1 |
| | Total | | \$9,423 | 112 28 (D) (D) 1,695 | 000 | 0000 | <u>©</u> @ | 53 (D) | <u>@</u> @ | Q | | * <u>(</u> (((() | (D) (D) 723 |
| | Company | | \$90,580 | 1,277 236 201 1,174 14,439 | 5,225 6,947 2,267 | 2,487 (D) 455 706 | 225 | 748 13,720 | 10,419 | 8,865 | | 102 (S) 3,177 2,403 | 102 (S) 3,177 2,403 14,858 |
| Total | Federal | | \$26,372 | 200 (D) 0 000 (D) 0 | 165 (D) | 1 (Q) (Q) 8 | <u>0</u> 0 | 226 1,055 | 00 | 4,550 | | (D) 288 (D) | (D) 288 (D) (D) |
| | Total | | \$116,952 | 1,277 (D) (D) (D) 14,648 | 5,390 (D) (D) | 2,498 (D) (D) 714 | <u>0</u> 0 | 974 | <u>©</u> | 13,415 | | 102 (D) 3,465 (D) | 102 (D) 3,465 (D) 27,428 |
| | SIC code | | | 20,21 22,23 24,25 26 26 28 | 281-82,286 283 284-85,287-89 | 13,29 30 32 33 33 | 331-32,3398-99 333-36 | 34 | 357 351-56,358-59 | 36 | | 365 366 367 367-64,369 | 365 366 367 361-64,369 |
| | Distribution by industry | | Total | Food, kindred, and tobacco products | Industrial chemicals | Petroleum refining and extraction | Ferrous metals and products | Fabricated metal products | Office, computing, and accounting machines | Electrical equipment | | Radio and TV receiving equipment | Radio and TV receiving equipment Communication equipment Electronic components Other electrical equipment Transportation equipment |

See explanatory information and SOURCE at end of table.

Table A-26. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1991

| Page 2 of 2 | | Company | | \$4,806 | 1,906 | 2,900 | 367 15,255 |
|-------------|-------------|--------------------------|-----------------------|---|--|---|--|
| ш. | Development | Federal | | \$1,483 | (a) | (a) | 1,849 |
| | | Total | | \$6,289 | <u>(a)</u> | Q) | 428 17,104 |
| | | Company | | (a) | (D) | 680 | 5,056 |
| | Applied | Federal | | (D) | <u>Q</u> | (D) | (D) 1,272 |
| | | Total | millions] | \$2,027 | (a) | (D) | (D) 6,328 |
| | | Company | [Dollars in millions] | (D) | (D) | 243 | (D) 2,630 |
| | Basic | Federal | | (D) | <u>Q</u> | <u>(a)</u> | (D) 2,384 |
| | | Total | | \$389 | (Q) | (a) | 5,014 |
| | | Company | | \$6,840 | 3,017 | 3,823 | (D) 22,941 |
| | Total | Federal | | \$1,865 | (D) | (a) | (D) 5,505 |
| | | Total | | \$8,705 | (D) | (D) | (D) 28,446 |
| | | SIC code | | 38 | 381-82 | 383-87 | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 |
| | | Distribution by industry | | Professional and scientific instruments | Scientific and mechanical measuring instruments. | opical, surgical, protographic, and other instruments | Other manufacturing industries |

 ⁽D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent. KEY:

The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change. NOTE:

Table A-27. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1992

| Page 1 of 2 t | Company | | \$67,428 | 801 188 (D) (D) 8,876 | 3,211 4,248 1,417 | 1,040 894 261 272 | 109 1,623 | 549 11,547 | 9,121 2,426 | 6,667 | 75 2,628 2,463 1,501 | 14,147 | (D) (D) 5,455 |
|-------------------|--------------------------|-----------------------|-----------|---|------------------------------------|-----------------------------------|-----------------------------|---------------------------|--|----------------------|---|--------------------------|--|
| Pa Development | Federal | | \$16,917 | (D) (D) 196 | 178 (D) (D) | 0002 | <u>0</u> 0 | 289 | <u>©</u> | 2,565 | 641 184 1,739 | 9,251 | (D) 8,409 |
| | Total | | \$84,345 | 801 198 (D) (D) 9,073 | 3,390 (D) (D) | (D) (D) 274 | 00 | 838 12,152 | <u>©</u> | 9,232 | 76 3,269 2,647 3,240 | 23,398 | (D) (D) 13,863 |
| | Company | | \$22,224 | 488 38 70 5,506 | 1,306 3,342 858 | 1,052 249 176 237 | 105 | 158 1,782 | 950 832 | 2,672 | (D) 731 (D) 1,091 | 1,406 | (D) (D) 735 |
| Applied | Federal | | \$4,951 | (D) (D) (D) 777 | 999 | 0000 | 0 (S) | <u>©</u> | (D) 25 | (D) | <u> </u> | 1,083 | (D) (D) 1,040 |
| | Total | nillions] | \$27,175 | 488 (D) 70 (D) 5,583 | 666 | 1,052 249 (D) | 105 | <u> </u> | (D) 857 | (Q) | <u> </u> | 2,489 | (D) 1,775 |
| | Company | [Dollars in millions] | \$7,002 | 122 33 (D) 2,038 | 635 1,232 171 | 238 (S) 42 33 | 9 24 | 57 | 579 165 | 350 | (D) 76 (D) 141 | 173 | 94 21 58 |
| Basic | Federal | | \$2,792 | 0 (D) 0 | (D 3) | <u>@</u> @@ | (a)° | <u>©</u> <u>0</u> | <u>©</u> | <u>(a)</u> | ° @@@ | 422 | 422 |
| | Total | | \$9,794 | 122 (D) (D) 2,054 | (D) 1,235 (D) | 9099 | (D) 24 | <u>0</u> 0 | <u>@</u> @ | (Q) | 0000 | 595 | 94 21 480 |
| | Company | | \$96,654 | 1,411 259 (D) 1,191 16,420 | 5,152 8,822 2,446 | 2,330 1,337 479 542 | 224 318 | 764 14,073 | 10,650 | 689'6 | 93 3,435 3,428 2,733 | 15,726 | (D) (D) 6,248 |
| Total | Federal | | \$24,660 | 0 (0 (0) (0) (0) | (S) (S) | 9 (3) (2) 8 | (a) | 293 1,062 | <u>(2)</u> | 3,857 | (D) 520 (D) 52 | 10,758 | (D) (D) 9,871 |
| | Total | | \$121,314 | 1,411 277 (D) (D) (D) 16,711 | 5,406 8,831 2,474 | 2,339 (D) (D) 555 | <u>(Q)</u> | 1,057 | <u>@</u> @ | 13,546 | (D) 3,678 (D) | 26,484 | (D) (D) 16,119 |
| | SIC code | | | 20,21 22,23 24,25 26 26 | 281-82,286 283 284-85,287-89 | 13,29 30 32 33 | 331-32,3398-99 333-36 | 34 | 357 351-56,358-59 | 36 | 365 366 367 361-64,369 | 37 | 373-75,379 372,376 372,376 |
| | Distribution by industry | | Total | Food, kindred, and tobacco products | Industrial chemicals | Petroleum refining and extraction | Ferrous metals and products | Fabricated metal products | Office, computing, and accounting machines | Electrical equipment | Radio and TV receiving equipment | Transportation equipment | Motor vehicles and motor vehicles equipment Other transportation equipment |

See explanatory information and SOURCE at end of table.

Table A-27. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1992

| Page 2 of 2 | | Company | | 4,718 | 1,687 | 3,031 | 407 |
|-------------|--------------------------|---------|-----------------------|---|---|--|--|
| 7 | Development | Federal | | 1,765 | <u>(Q)</u> | <u>(a)</u> | (D) 2,109 |
| | u | Total | | 6,483 | <u>(a)</u> | (a) | (D) 18,570 |
| | | Company | | 2,193 | 1,251 | 942 | 95 5,565 |
| | Applied | Federal | | 453 | (Q) | <u>(a)</u> | 1,479 |
| | | Total | illions] | 2,645 | <u>Q</u> | <u>(a)</u> | 7,044 |
| | | Company | [Dollars in millions] | 515 | 170 | 345 | 2,185 |
| | Basic | Federal | | 6 | <u>Q</u> | (Q) | (D) 2,304 |
| | | Total | | 524 | (Q) | <u>0</u> | (D) 4,489 |
| | | Company | | \$7,426 | 3,108 | 4,318 | (D) 24,211 |
| | Total | Federal | | \$2,226 | 2,148 | 78 | (D) 5,892 |
| | | Total | | \$9,652 | 5,256 | 4,396 | 30,103 |
| | SIC code | | | 38 | 381-82 | 383-87 | 27.31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 |
| | Distribution by industry | | | Professional and scientific instruments | Scientific and mechanical measuring instruments | Optical, surgical, protographic, and other instruments | Other manufacturing industries |

⁽D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent. KEY:

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-28. Number of R&D-performing companies conducting basic research, by industry and size of company: 1992

| Page 1 of 2 | 25,000 or more employees | Basic research | 1 44 | (C) (D) (D) (D) (D) (D) (D) (D) (D) (D) (D | (a) (b) (c) (c) (c) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d | © (Q | (a) (a) (a) | 0 8 (D) | (a) (a) (a) | 10 (D) | ° (2) (2) (2) (2) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4 | 13 (D) | (a) (a) (a) |
|-----------------|-------------------------------|-------------------|--------|--|--|--|-----------------------------|---------------------------|--|----------------------|---|--------------------------|---|
| | 25,000 emp | R&D | 121 | (D) (D) (D) | 000 | ° (2) (2) | 7) | | 5,0 | - | | - | 1) |
| | 24,999 /ees | Basic research | 54 | (a) | <u> </u> | <u> </u> | ° (a) | <u>@</u> @ | (Q) | (Q) | 0000 | 9 | 000 |
| | 10,000 to 24,999 employees | R&D | 191 | 0 0 0 10 7 4 | 5 0 0 | <u>0</u> 0°0 | <u>@</u> @ | 11 | <u>0</u> 0 | 13 | 0000 | 12 | (a) (a) ' |
| | 9,999 9,999 | Basic research | 77 | (D) 0 0 10 10 10 10 10 10 10 10 10 10 10 10 | 000 | °° (2) (2) | (a) | <u> </u> | ° (a) | (a) | 0000 | 9 | <u>(a) (a)</u> |
| mpany | 5,000 to 9,999 employees | R&D | 260 | (D) 7 9 9 | <u></u> <u> </u> | 1000 | 00 | 110 | 12 | 14 | 0 0 7 7 | 25 | <u>(a)</u> (a) |
| Size of Company | 4,999 ees | Basic research | 259 | (D) 11 30 90 | 1 2 2 | (D) 7 (D) 10 | <u>0</u> 0 | 18 | 71 | 22 | (a) (a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c | 14 | (D) (D) 8 |
| | 1,000 to 4,999 employees | R&D | 1,171 | 63 33 74 74 | 28 17 29 | 11 50 24 48 | 30 | 73 135 | 53 | 124 | (D) 47 47 | 62 | 30 30 30 |
| | 999 668 | Basic research | 124 | 12(0)(0) 12 | 000 | 00000 | <u>0</u> 0 | <u>+ +</u> | φω | 11 | ° <u>©</u> <u>©</u> <u>©</u> | 8 | <u>0</u> 00 |
| | 500 to 999 employees | R&D | 883 | 40 30 (D) 54 61 | 25 8 28 | (D) 35 19 40 | 31 | 116 | 42 | 86 | (D) (D) (D) (D) | 37 | 7 10 20 |
| | n 500 | Basic research | 8,991 | 1,027 9 125 (D) 1,110 | 562 284 264 | 95 349 74 35 | <u>©</u> | 1,180 | 1,097 | 561 | (D) 232 139 | (D) | 000 |
| | Fewer than 500 employees | R&D | 33,529 | 1,126 79 356 48 1,893 | 634 368 891 | 201 1,736 309 214 | 69 | 574 4,600 | 855 3,745 | 2,785 | 153 430 1,399 803 | 390 | 10 64 316 |
| | SIC code | | | 20,21 22,23 24,25 26 28 | 281-82,286 283 284-85,287-89 | 29 32 33 33 | 331-32,3398-99 333-36 | 34 | 357 351-56,358-59 | 36 | 365 366 367 367-64,369 | 37 | 371 373-75,379 372,376 |
| | Industry | | Total | Food, kindred, and tobacco products | Industrial chemicals Drugs and medicines Other chemicals | Petroleum refining | Ferrous metals and products | Fabricated metal products | Office, computing, and accounting machines. Other machinery, except electrical | Electrical equipment | Radio and TV receiving equipment. Communication equipment. Electronic components Other electrical equipment | Transportation equipment | Motor vehicles and motor vehicles equipment. Other transportation equipment. Aircraft and missiles. |

See explanatory information and SOURCE at end of table.

Table A-28. Number of R&D-performing companies conducting basic research, by industry and size of company: 1992

| | | | | | | | | | | | | | Page 2 of 2 |
|--|---|--------------------------|-------------------|-------------------------|-------------------|-----------------------------|-------------------|-------------------|-----------------------------|-------------------------------|-------------------|-----------------------------|-------------------|
| | | | | | | | Size of Company | ompany | | | | | |
| Industry | SIC code | Fewer than 500 employees | ın 500 ees | 500 to 999 employees | yees | 1,000 to 4,999 employees | , 4,999 yees | 5,000 to emplo | 5,000 to 9,999 employees | 10,000 to 24,999 employees | , 24,999 yees | 25,000 or more employees | r more rees |
| 0 | | R&D | Basic research | R&D | Basic research | R&D | Basic research | R&D | Basic research | R&D | Basic research | R&D | Basic research |
| Professional and scientific instruments | 38 | 2,282 | 388 | 75 | 11 | 72 | 13 | 80 | (Q) | (a) | (a) | (D) | (a) |
| Scientific and mechanical measuring instruments. | 381-82 | 1,229 | 209 | 30 | (<u>D</u>) | 37 | ω | <u>(a)</u> | (Q) | (a) | 0 | (Q) | <u>(a)</u> |
| Optical, surgical, protographic, and other instruments | 384-87 | 1,053 | 179 | 45 | (a) | 35 | 7 | (a) | (0) | (D) | (a) | (D) | (a) |
| Other manufacturing industries | 27,31,39 | 1,063 | 351 | 27 | (a) | 20 | 18 | 6 | 0 | (Q) | (D) | (a) | (a) |
| Nonmanufacturing industries | 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 | 15,873 | 3,635 | 171 | 23 | 271 | 70 | 88 | 35 | 51 | 5 | 40 | 10 |
| | | | _ | | _ | _ | - | | | | | - | |

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

Table A-29. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry: 1982-92 and projected 1993

| | | | | | | - | | | | | | Pa | Page 1 of 2 |
|---|--|--|------------------------|---------------------------|---------------------------|-------------------|-----------------------|---------------------------|--------------------------|--------------------|---------------------------|---------------------------|---------------------------|
| Industry | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | Projected 1993 |
| | <u> </u> | | | | | | [Dollars in millions] | millions] | | | | | |
| Total | | \$4,240 | \$4,345 | \$4,446 | \$3,954 | \$3,358 | \$3,576 | \$3,706 | \$3,789 | \$4,004 | \$4,615 | \$4,889 | \$5,079 |
| Food, kindred, and tobacco products 1/. Texfiles and apparel. Lumber, wood products, and furniture. Paper and allied products Chemicals and allied products | 20,21 22,23 24,25 26,25 26 | (E) (E) (B) (B) (B) (B) (B) (B) (B) (B) (B) (B | EE 348 | (S) 2 5 5 191 | 2 1 3 (D) 162 | (8) (G) (G) 5 | (S) (D) (S) | 9 <u>0</u> 00 0 | <u> </u> | <u> </u> | <u> </u> | @°@@@ | @°@@@ |
| Industrial chemicals | 281-82,286 283 284-85,287-89 | 338 EE | 335 (T) | <u>\$</u> 00 | (0) | (D) | °(Q)(Q) | <u> </u> | <u></u> <u></u> <u> </u> | <u> </u> | 000 | 000 | <u> </u> |
| Petroleum refining and extraction. Rubber products Stone, clay, and glass products | 13,29 30 32 33 33 | 1,162 14 17 101 | 1,284 17 7 92 | 1,356 16 5 (S) | (C) (D) (S) | (D) (D) 74 | 914 (D) 1 | 1,056 (D) (D) 21 | 1,128 (D) (D) | 1,17 (0) (0) | 1,416 (D) (D) 26 | 1,401 (D) (D) 23 | 1,395 (D) (D) 24 |
| Nonferrous metals and products | 331-32,3398-99 333-36 | 79 | 35 | 35 (S) | 26 (S) | <u>©</u> | <u>0</u> 0 | <u>0</u> 0 | 00 | <u> </u> | <u>0</u> 0 | <u>0</u> 0 | 00 |
| Fabricated metal products | 34 | 45 183 | 31 | (D) | 8 240 | (D) 261 | 00 | (D) 244 | (D) 260 | (D) 254 | (S) | (S) | (S) |
| Office, computing, and accounting machines | 357 351-56,358-59 | 16 167 | (E) 1441 | (S) 179 | 12 228 | <u>©</u> | <u>0</u> 0 | <u>©</u> | <u>@@</u> | 235 | <u>©</u> | <u> </u> | <u>©</u> |
| Electrical equipment. | 36 | 831 | 813 | 752 | 733 | (D) | 578 | <u>(</u>) | (D) | (a) | (<u>0</u>) | <u>(D)</u> | (D) |
| Radio and TV receiving equipment Communication equipment Electronic components Other electrical equipment | 365 366 367 361-64,369 | 5 155 40 631 | 150 82 82 581 | (D) (D) 618 | 0 (0) | ° @ @ @ | 0000 | ° @ @ @ | ° @ @ @ | ° 6 6 6 | ° @ @ @ | ° (a) | 0 (0) (0) |
| Transportation equipment | 37 | E | E | <u>O</u> | (S) | (S) | (S) | (D) | 847 | 863 | (8) | (S) | (S) |
| Motor vehicles and motor vehicles equipment | 371 373-75,379 372,376 | (2) 2 363 | (2) 2 425 | (D) 1 661 | (D) (B) (831 | (D) (D) 537 | (D) 754 | 000 | 000 | <u>0</u> 00 | (a) (a) | (a) (b) | (a) (a) |

See explanatory information and SOURCE at end of table.

Table A-29. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry: 1982-92 and projected 1993

| Page 2 of 2 | Projected 1992 1993 | | (S) (S) | (a) | (a) (a) | (D) 0 824 811 |
|-------------|------------------------|-----------------------|---|---|---|--|
| | 1991 | | (8) | (<u>Q</u>) | (<u>O</u>) | (D) (D) |
| | 1990 | | \$11 | (D) | (D) | (D) 730 |
| | 1989 | | \$12 | (D) | <u>(D</u> | (D) 614 |
| | 1988 | millions] | \$16 | Q) | (D) | (D) 551 |
| | 1987 | [Dollars in millions] | \$17 | (D) | <u>(Q</u>) | 433 |
| | 1986 | | <u>(a)</u> | (<u>O</u>) | 0 | 328 |
| | 1985 | | (D) | (D) | (Q) | 338 |
| | 1984 | | \$36 | (a) | <u>Q</u> | 424 |
| | 1983 | | \$45 | Ê | E | 349 |
| | 1982 | | \$54 | E | E | 375 375 |
| | SIC code | , | 38 | 381-82 | 384-87 | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 |
| | Industry | | Professional and scientific instruments | Scientific and mechanical measuring instruments | Optical, suggest, procediapine, and other instruments | Other manufacturing industries 1/ |

1/ Until 1984, tobacco products (SIC 21) was included with "other manufacturing industries." 2/ Less than \$0.5 million.

 (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 (T) ≈ Data not separately available, but are included in total. KEY:

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

Table A-30. Company and other (except Federal) funds for industrial energy R&D performance, by selected industry: 1982-92 and projected 1993

| | | | | | | | | | | | | _ | age 1 of 1 |
|-------------------------------------|-------------------|---------|---------|------------|------------|--------------|-----------------------|------------|------------|------------|------------|------------|-------------------|
| Industry | SIC cade | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | Projected 1993 |
| | | | | | | ۵ | [Dollars in millions] | S] | | | | | |
| Total | | \$2,762 | \$2,842 | \$2,962 | \$2,537 | \$2,167 | \$2,410 | \$2,317 | \$2,418 | \$2,558 | \$2,691 | \$2,812 | \$2,883 |
| Chemicals and allied products | 28 | 178 | 166 | 169 | (Q) | <u>(a)</u> | 0 | <u>(a)</u> | <u>(a)</u> | <u>(</u>) | <u>(a)</u> | (D) | (Q) |
| Petroleum refining and extraction | 13,29 | 1,096 | 1,218 | (a) | 1,145 | 126 | 911 | 1,050 | _ | 1,174 | 1,409 | 1,394 | 1,387 |
| Machinery | 35 | E | E | <u>(a)</u> | <u>(a)</u> | <u>(a)</u> | <u>a</u> | 229 | | 220 | (S) | 229 | (S) |
| Electrical equipment. | 36 | 146 | 132 | 123 | 71 | <u>Q</u> | <u>a</u> | 123 | | 06 | 101 | <u>(a)</u> | <u>a</u> |
| Aircraft and missiles | 372,376 | 66 | E | 190 | 264 | 236 | 0 | 0 | | (Q) | <u>(a)</u> | <u>(a)</u> | <u>(a)</u> |
| All other manufacturing industries. | | 1,079 | E | 779 | 610 | 497 | 564 | 450 | | 173 | (S) | (S) | (S) |
| Nonmanufacturing industries | 07-10, 12-17, | 164 | 143 | 189 | 84 | (<u>a</u>) | 170 | 195 | | 290 | 274 | 311 | 247 |
| • | 40-42, 44-49, | | | | | | | | | | | | |
| | 50-59, 60-65, 67, | | | | | | | | | | | | |
| | 701, 73, 75-76, | | | | | | | | | | - | | |
| | 78-79, 80-81, | | - | | | | | | | | | | |
| | 83-84, 87, 89 | | | | | | | | | | | | |

 Data have been withheld to avoid disclosing operations of individual companies.
 Data have been withheld due to imputation of more than 50 percent.
 Data not separately available, but are included in total. (a) (c) KEY:

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information. NOTE:

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-31. Federal funds for industrial energy R&D performance, by selected industry: 1982-92 and projected 1993

| 1982 1983 |
|-----------|
| |
| \$1,478 |
| 169 |
| 8 E |
| 685 |
| 264 |
| 211 |
| |
| |
| |
| - |
| |

Data have been withheld to avoid disclosing operations of individual companies.
 Data have been withheld because of imputation of more than 50 percent.
 Data not separately available, but are included in total.

KEY:

(a)(c)

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information. NOTE:

Table A-32. Total (company, Federal, and other) funds for industrial energy R&D performance, by primary energy source: 1982-92 and projected 1993

| | | | | _ | [Dollars in millions] | [2] | | | | | | Page 1 of 1 |
|---|---------|-------------------------|------------|----------------------------|-----------------------|------------------|---------------------|------------|--|------------------|------------|-------------------|
| Primary energy source | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | Projected 1993 |
| Total | \$4,240 | \$4,345 | \$4,446 | \$3,954 | \$3,358 | \$3,576 | \$3,706 | \$3,789 | \$4,004 | \$4,615 | \$4,889 | \$5,079 |
| Fossil fuels | 1,491 | 1,573 | 1,738 | 1,876 | 1,476 | 1,548 | \$1,583 | \$1,652 | \$1,879 | 2,128 | (S) | (S) |
| Oil | N'N'N'N | 905 255 48 (¬) | Y Y Y Y | 1,395 189 125 150 | 4 4 4 4 Z Z Z Z | (S) 191 11 | 4444 2222 | (8) | & & & & & & & & & & & & & & & & & & & | (S)(S)(S) | Y Y Y Y | Y Y Y Y |
| Synthetic fassil fuels | Y Y Z | EEE | A A A | 111 | 4 4 4 2 2 2 | 23 3 (S) | N N N | 17 (S) | N N N | <u>(8)(8)(8)</u> | A A A | N N N N A A |
| Other fossil fuels | N/A | E | N/A | 17 | N/A | 51 | N/A | (S) | N/A | 58 | N/A | N/A |
| Nuclear | 1,078 | 1,118 | 1,113 | 1,212 | 626 | 926 | 1,098 | 919 | 973 | 1,139 | 1,191 | 1,359 |
| 24 Fission | Z Z Z | 973 145 | N/A A/A | 1,062 | N/A | 859 (S) | N/A N/A | 856 63 | N/A N/A | 1,134 | N/A A/A | N/A N/A |
| Total geothermal, solar, and conservation and utilization | A/N | 1,424 | 1,218 | 471 | 504 | 421 | 492 | 612 | (D) | 998 | 1,029 | 966 |
| Geothermal | Y Z Z | EE | N/N A/A | 54 96 | N/N N/A | 48 95 | N/A N/A | <u>Q</u> Q | N/N N/A | (S) (S) | Z Z Z Z | N N N/A |
| Conservation and utilization | N/A | E | N/A | 321 | N/A | 281 | N/A | 391 | N/A | (S) | N/A | N/A |
| All other energy | N/A | 230 | 377 | 395 | 399 | (S) | 533 | 909 | 681 | 205 | (S) | (S) |
| | | | | | | | | | | | | |

 ⁽D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data are not separately available, but are included in total.
 N/A = Not available KEY:

Detailed data for 1983, 1985, 1987, and 1989 were estimated on the basis of (a) data actually reported in those years, (b) revised data for those years reported on the 1984, 1986, 1988 and 1990 survey forms, and (c) adjustments to new samples in 1987.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information. NOTES:

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-33. Company and other (except Federal) funds for industrial energy R&D performance, by primary energy source: 1982-92 and projected 1993

| | | | | | | | | | | | | Page 1 of 1 |
|---|---------------------------------------|---------|------------|----------------------------|---------------------------------------|-------------------------|---------------------------------------|-----------|---------------------------------------|-------------|--------------------|-------------------|
| Primary energy source | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | Projected 1993 |
| Total | \$2,762 | \$2,842 | \$2,962 | \$2,537 | \$2,167 | \$2,410 | \$2,317 | \$2,418 | \$2,558 | \$2,691 | \$2,812 | \$2,883 |
| Fossil fuels | 1,361 | 1,455 | 1,509 | 1,797 | (a) | (a) | 1,519 | 1,485 | 1,704 | 1,869 | 1,918 | 1,953 |
| Oil | N N N N N N N N N N N N N N N N N N N | EEEE | Y Y Y Y | 1,381 (D) 124 (S) | & | (S) (S) (S) 29 | A A A A A A A A A A A A A A A A A A A | (S)(S)(S) | N N N N N N N N N N N N N N N N N N N | (8)(8)(8) | 4 4 4 4 2 2 2 2 | Y Y Y X |
| Synthetic fossil fuels | Z Z Z | EEE | N N N | 91 8 (S) | Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z | (S) (Q) | 4 4 4 Z Z Z | 000 | 4 4 4 Z Z Z | <u>@</u> QQ | N N N N N N | N N N |
| Other fossil fuels | N/A | E | N/A | 17 | N/A | (S) | N/A | (S) | N/A | (S) | N/A | N/A |
| Nuclear | 66 | 06 | 101 | 150 | 91 | 109 | 117 | 39 | 72 | 46 | 09 | 208 |
| FissionFusion | N/N N/A | 71 | A/N A/A | 135 | N/A | 82 (S) | Z Z Z/Z | 27 | Z Z Z | 45 | N/A | A A/N |
| Total geothermal, solar, and conservation and utilization | N/A | 1,147 | 1,086 | 313 | (Q) | (a) | 314 | 416 | 278 | 478 | 571 | 531 |
| GeothermalSolar | N N A A | EE | N/A N/A | 27 | N/A N/A | (D) 41 | N N N/A | 00 | ΥΫ́ | (S) (S) | N/N N/A | N/A N/A |
| utilization | N/A | (E) | N/A | 235 | N/A | <u>(a)</u> | N/A | 384 | N/A | (S) | N/A | N/A |
| All other energy | N/A | 150 | 267 | 277 | (D) | (a) | 367 | 478 | 504 | 298 | 263 | 196 |
| | | | | | | | | | | | | |

(D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data not separately available, but are included in total.
 N/A = Not available

KEY

Detailed data for 1983, 1985, 1987, 1989, and 1991 were estimated on the basis of (a) data actually reported in those years, (b) revised data for those years reported on the 1982, 1984, 1986, 1988, 1990, and 1992 survey forms and, (c) adjustments to new samples in 1981 and 1987.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information. NOTES:

Table A-34. Federal funds for industrial energy R&D performance, by primary energy source: 1982-92 and projected 1993

| Projected 1993 | (S) | (S) | N N N N N/A N/N | A A A | N/A | 1,151 | N/A N/A | (S) | A A A | N/A | (S) |
|-----------------------|---------|--------------|---------------------------------------|------------------------|--------------------|---------|---------------|---|-----------------|------------------------------|------------------|
| 1992 | 2,077 | (S) | N N N N N N N N N N N N N N N N N N N | & & & & Z Z Z | N/A | 1,133 | N/N A/A | (S) | A A | A/N | 221 |
| 1991 | 1,924 | (S) | (8)(8)(8) | <u>(S)</u> (Q)(Q) | (S) | 1,093 | 1,089 | (S) | 11 | (S) | (S) |
| 1990 | \$1,446 | (0) | A A A A | ZZZZ | N/A | 901 | N/A N/A | (D) | N N N/A | N/A | 177 |
| 1989 | \$1,371 | 167 | (S)(S)(S) | <u>0</u> 00 | (S) | 880 | 829 | 196 | 00 | 106 | 128 |
| 1988 | \$1,389 | 63 | 4 4 4 4 2 2 2 2 | A A A | N/A | 981 | X X X | 179 | Z Z Z | N/A | 166 |
| 1987 | \$1,166 | (D) | (0) (0) (2) | 8 (Q) (Q) | - | 817 | (S) | (Q) | (D) 37 | (D) | (D) |
| 1986 | \$1,191 | (a) | 4 4 4 4 2 2 2 2 | A A A | N/A | 888 | Z Z Z | (<u>a</u>) | ¥ X Z Z | N/A | (D) |
| 1985 | \$1,417 | 78 | (D) 13 | 20 0 (S) | 0 | 1,063 | 928 | 158 | 26 45 | 87 | 118 |
| 1984 | \$1,484 | 228 | A A A A | Z Z Z | N/A | 1,013 | N/N A/N | 132 | A X X | N/A | 110 |
| 1983 | \$1,503 | 117 | (E) 01 67 97 | EEE | 16 | 1,029 | 902 | 277 | EE | 80 | 80 |
| 1982 | \$1,478 | 130 | & & & & & & & & & & & & & & & & & & & | N N N N/A | N/A | 979 | N/A N/A | N/A | A X X | N/A | N/A |
| Primary energy source | Total | Fossil fuels | Oil | Synthetic fossil fuels | Other fossil fuels | Nuclear | FissionFusion | G Total geothermal, solar, and conservation and utilization | GeothermalSolar | Conservation and utilization | All other energy |

 (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data not separately available, but are included in total.
 N/A = Not available KEY:

Detailed data for 1981, 1985, 1985, 1987, and 1989 were estimated on the basis of (a) data actually reported in those years, (b) revised data for those years reported on the 1980, 1982, 1986, 1988, and 1990 survey forms, and (c) adjustments to new samples in 1981 and 1987.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information. NOTES

Table A-35. Number of companies performing energy R&D and total number of R&D-performing companies, by industry and size of company: 1992

| Page 1 of 2 | | more | Energy | 34 | °°° <u>6</u> | (a) | °° (2) (2) | ©° | ° (a) | <u>0</u> 0 | (<u>Q</u>) | ° @ @ @ | ∞ | (a) |
|--|-----------------|-------------------------------|--------|--------|-------------------------------------|------------------------------------|---|---|---------------------------|---|----------------------|---|--------------------------|--|
| | | 25,000 or more employees | Total | 121 | (D) (D) (D) 7 | <u></u> <u> </u> | ° (2) (2) | <u>0</u> 0 | 0 80 | 00 | 10 | ° (2) (2) | 13 | (a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c |
| | | 24,999 /ees | Energy | 38 | 00000 | <u>©</u> ©° | <u>0</u> <u>0</u> <u>0</u> <u>0</u> | <u>0</u> 0 | 00 | ° <u>(</u>) | <u>(</u>) | °(0°(0) | (D) | (a) (a) |
| | | 10,000 to 24,999 employees | Total | 191 | £1 0 0 0 7 7 | 0 (0) | <u>0</u> 0°0 | 00 | 17 | <u>@</u> @ | 13 | <u> </u> | 12 | (O) (O) (D) |
| | | 9,999 yees | Energy | 26 | <u>©°°</u> ©© | (a) | <u>()</u> () | (a) | <u>(a)</u> | 00 | (Q) | 0000 | (D) | (Q) (Q) |
| | mpany | 5,000 to 9,999 employees | Total | 260 | (D) 7 7 81 | 000 | 7000 | (D) | 11 | 12 | 14 | 0 0 7 7 | 25 | (a) (a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c |
| | Size of company | 4,999 yees | Energy | 52 | 00000 | (a) | <u>(a) (a) (a) (a) (a) (a) (a) (a) (a) (a) </u> | <u>©</u> | 00 | <u>(a) (a)</u> | 10 | ° <u>6</u> <u>6</u> <u>6</u> | (0) | (a) (a) |
| | | 1,000 to 4,999 employees | Total | 1,171 | 63 55 33 74 | 28 17 29 | 11 50 24 48 | 30 | 73 135 | 53 | 124 | (D) (T) (D) (D) | 62 | (D) 30) |
| | | 999 yees | Energy | 13 | 0000 | (a) | 0000 | 00 | 09 | <u>0</u> 0 | (a) | 00 O | 0 | 000 |
| The state of the s | | 500 to 999 employees | Total | 883 | 0 3 4 (D) 3 4 54 | 25 8 28 | (D) 35 19 40 | 31 | 116 | 42 | 86 | (D) (D) 4 5 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 | 37 | 7 10 20 |
| | | an 500 /ess | Energy | 16 | 0000(0) | 000 | (a) | 00 | 00 | 00 | (D) | 0000 | 0 | 000 |
| | | Fewer than 500 employess | Total | 33,529 | 1,126 79 356 48 1,893 | 634 368 891 | 201 1,736 309 214 | 145 | 574 4,600 | 855 3,745 | 2,785 | 153 430 1,399 803 | 390 | 10 64 316 |
| | | SIC code | | | 20,21 22,23 24,25 26 | 281-82,286 283 284-85,287-89 | 29 32 33 33 | 331-32,3398-99 333-36 | 34 | 357 351-56,358-59 | 36 | 365 366 367 361-64,369 | 37 | 373-75,379 372,376 372,376 |
| | | Industry | | Total | Food, kindred, and tobacco products | Industrial chemicals | Petroleum refining | Ferrous metals and productsNonferrous metals and products | Fabricated metal products | Office, computing, and accounting machines Other machinery, except electrical | Electrical equipment | Radio and TV receiving equipment | Transportation equipment | Motor vehicles & motor vehicles equipment |

See explanatory information and SOURCE at end of table.

Table A-35. Number of companies performing energy R&D and total number of R&D-performing companies, by industry and size of company: 1992

Page 2 of 2

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-36. Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance, by industry: 1982-92 and projected 1993

| Page 1 of 2 | Projected 1993 | | (S) | (D) 1 13 140 | 99 18 23 | (D) 39 9 | <u>0</u> 0 | (S) (S) | 0 (S) | (D) | 0 (0) (0) | (S) | (D) 138 |
|-------------|-------------------|-----------------------|---------|--|------------------------------------|---|---|-----------------------------|---|----------------------|--|--------------------------|--|
| | 1992 | | \$1,301 | (D) 1 13 140 | 99 18 23 | 107 | 4 ← | (S) | (g) O | (D) | ° (2) (2) | (8) | 1200 |
| | 1991 | | \$1,326 | (S) (D) 13 188 | (S) 16 26 | (8) | <u>0</u> 0 | (8) | 00 | (D) | 0 (0) (0) | (S) | 00011 |
| | 1990 | | \$1,044 | 2 2/ (D) 18 163 | (D) (D) 67 | 72 1 (D) 8 | <u>0</u> 0 | 116 | 116 | - | -1280 | (8) | (D) (D) 195 |
| | 1989 | | \$1,372 | 3 2/ (D) 19 178 | (D) | 75 1 (D) 10 | <u>0</u> 0 | | 111 | ō. | 0 (0) (0) | (S) | (D) 120 |
| | 1988 | uns] | (8) | (S) (D) 136 | 11 (0) (0) | 09 (S) (G) | <u>Q</u> Q | (D) 46 | 0 46 | 0 | ° (a) ° (a) | (8) | 103 |
| | 1987 | [Dollars in millions] | (S) | \$1 2/ (D) 7 | 12(0) | (D) (D) 5 | <u> </u> | (D) 38 | 38 | (D) | ° @@@ | (S) | (D) (D) 123 |
| | 1986 | 11 | (S) | \$1 (D) 7 7 | (S) (D) (D) | (D) 8 | 6 2 | (D) | 33 | 5 | 0 - (3(3) | (S) | (D) (D) 87 |
| | 1985 | | (S) | \$1 2/ 1 8 (S) | (S) (D) 4+ | (D) (D) (D) | <u>_</u> 0 | 9 26 | 26 | <u>Q</u> | 0 1 (D) | (S) | (S) (D) (S) |
| | 1984 | | \$1,060 | 12 (S) (D) 7 158 | 140 | 88 (D) (S) | 6 8 | 14 26 | 00 | (D) | 0000 | (S) | <u> </u> |
| | 1983 | | (S) | \$9 (T) 2 6 6 | 144 | 18 17 27 27 27 27 27 27 27 27 27 27 27 27 27 | 110 | 27 | 27 | 18 | °EE2 | E | EEE |
| | 1982 | | (S) | £ (E) 8 161 | 173 6 12 | 97 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | 60 | 30 | 30 | 24 | °EEE | E) | E°E |
| | SIC code | | | 20,21 22,23 24,25 26 26 | 281-82,286 283 284-85,287-89 | 13,29 30 32 32 33 | 331-32,3398-99 333-36 | 34 | 351-56,358-59 | 36 | 365 366 367 361-64,369 | 37 | 373-75,379 372,376 |
| | Industry | | Total | Food, kindred, and tobacco products 1/ | Industrial chemicals | Petroleum refining and extraction Rubber products Stone, clay, and glass products Primary metals | Ferrous metals and productsNonferrous metals and products | S Fabricated metal products | Office, computing, and accounting machines Other machinery, except electrical | Electrical equipment | Radio and TV receiving equipment. Communication equipment. Electronic components. Other electrical equipment. | Transportation equipment | Motor vehicles & motor vehicles equipment Other transportation equipment |

See explanatory information and SOURCE at end of table.

Table A-36. Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance, by industry: 1982-92 and projected 1993

| Page 2 of 2 | Projected 1993 | | \$ | (D) | (D) | (S) (S) | |
|-------------|-------------------|-----------------------|---|---|--|--------------------------------|---|
| • | 1992 | | \$6 | (D) | (Q) | (D) 142 | |
| | 1991 | | \$10 | (<u>O</u>) | <u>Q</u> | (D) 140 | |
| | 1990 | | \$4 | (a) | (Q) | (8) | |
| | 1989 | | (D) | (D) | <u>Q</u> | (S) | |
| | 1988 | [S] | \$3 | (0) | (D) | <u>(8)</u> | |
| | 1987 | [Dollars in millions] | (Q) | (D) | <u>(Q)</u> | (D) 113 | |
| | 1986 | O] | (Q) | (D) | Q) | 80 | |
| | 1985 | | \$2 | (D) | (D) | (S) | |
| | 1984 | | \$2 | (D) | (D) | 113 | |
| | 1983 | | € | - | 7 | 124 | |
| | 1982 | | E | E | E | (E) | |
| | SIC code | | 38 | 381-82 | 384-87 | 27,31,39 | 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 783-84, 87, 89 |
| | Industry | | Professional and scientific instruments | Scientific and mechanical measuring instruments | Optical, surgical, photographic, and other instruments | Other manufacturing industries | |

^{1/} Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries." 2/ Less than \$0.5 million. 3/ Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

KEY:

 ⁽D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data not separately available, but are included in total.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information. NOTE:

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-37. Company and other (except Federal) funds for industrial pollution-abatement R&D performance, by selected industry: 1982-92 and projected 1993

| Page 1 of 1 | Projected 1993 | | (S) | 4 <u>0</u> |
|-------------|-------------------|-----------------------|-------|--|
| | 1992 | | (S) | 4 <u>0</u> |
| | 1991 | | (S) | 0.00.00.00.00.00.00.00.00.00.00.00.00.0 |
| | 1990 | | \$955 | 163 (D) (D) (D) (D) (D) (D) (D) (D) (D) (D) |
| | 1989 | | (8) | (C) (C) 737 737 588 |
| | 1988 | illions] | (8) | 0.840000 |
| | 1987 | [Dollars in millions] | (S) | (D) |
| | 1986 | | (S) | (D) 33 833 (D) |
| | 1985 | | (S) | <u> </u> |
| | 1984 | | (S) | (D) (D) (D) (D) 24 24 47 |
| | 1983 | | (S) | 28 25 7 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 |
| | 1982 | | (S) | 22 22 38 38 |
| | SIC code | | | 28 13,29 35 36 372,376 07-10, 12-17, 40-42, 44-49, 50-59, 60-55, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 |
| | Industry | | Total | Chemicals and allied products Petroleum refining and extraction Machinery |

 (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data not separately available, but are included in total. KEY:

1/ Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

Table A-38. Federal funds for industrial pollution-abatement R&D performance, by selected industry: 1982-92 and projected 1993

| Page 1 of 1 | Projected 1993 | | \$122 | 00 | °66° | s (s) | |
|-------------|-------------------|-----------------------|-------|---|--|---|---|
| | 1992 | | 26\$ | 0+ | ° <u>6</u> 6° | (a) | |
| | 1991 | | \$92 | 0 0 | ° 666 | <u>0</u> 0 | |
| | 1990 | | \$89 | 0 0 | °666 | <u>0</u> 0 | |
| | 1989 | | (S) | <u></u> <u> </u> | <u>3</u> 6% ° | °© | |
| - | 1988 | illions] | \$191 | <u>©</u> ° | °66° | °ê | |
| | 1987 | [Dollars in millions] | \$186 | 00 | ° 65 6 | <u>0</u> 0 | |
| | 1986 | | \$148 | <u>©</u> ° | °666 | <u>0</u> 0 | |
| | 1985 | | \$169 | (a) o | <u> </u> | <u>0</u> 0 | |
| | 1984 | | \$169 | 00 | 6669 | 62 | |
| | 1983 | | \$176 | 99 | E°E | (<u>†</u> | |
| | 1982 | | \$122 | 89 | E¤E | 58 | |
| | SIC code | | | 13,29 | 35 36 372,376 | 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67 | 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 |
| | Industry | | Total | Chemicals and allied products Petroleum refining and extraction | Machinery Electrical equipment Aircraft and missiles | All other manutacturing industries Nonmanufacturing industries 1/ | |

 (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data not separately available, but are included in total. KEY::

Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

Table A-39. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and size of company: 1983-93

| | SIC code | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|--|------------------------------------|----------------------------------|---------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|---|-----------------------------------|-----------------------------------|
| | | | | | | | [In thousands] | 1 | | 1 | | |
| Total (January) | | 540.9 | 584.1 | 622.5 | 671.0 | 695.8 702.2 | 708.6 | 722.5 | 743.6 758.5 | 773.4 | 779.3 783.8 | 787.1 N/A |
| Distribution by industry: | | | , | | | | | • | | | | |
| Food, kindred, and tobacco products 1/ | 20,21 22,23 24,25 28 | 7.7 2.2 1.8 7.6 67.3 | 7.4 2.3 (T) 6.6 6.6 | (S) 2.8 (S) 6.6 71.1 | (S) (S) (S) 6.4 75.8 | (S) 2.4 1.3 6.0 75.2 | (S) 2.4 1.3 6.1 75.8 | (S) 2.5 1.4 6.4 78.3 | (S) 2.8 (S) 8.5 80.4 | 9.4 (S) (S) (S) (S) 81.6 | 9.8 2.8 1.5 10.7 85.6 | 9.9 3.1 1.7 10.7 89.2 |
| Industrial chemicals | 281-82,286 283 284-85,287-89 | 26.6 28.2 12.1 | 25.6 (T) 13.4 | 23.5 30.8 16.7 | 24.9 31.8 19.1 | (S) 32.6 20.2 | (S) 33.0 20.3 | (S) 34.4 18.8 | (S) 34.3 18.9 | (S) 35.4 17.0 | 29.9 38.7 17.0 | 29.6 42.6 17.0 |
| Petroleum refining and extraction | 13,29 30 32 33 | (T) (5.5 8.3 | 13.3 (T) 5.6 8.8 | 13.5 (S) 6.6 7.1 | 10.4 (S) 7.5 5.7 | 9.9 (S) 8.6 5.5 | 9.5 (S) 8.6 5.6 | 10.7 (S) 7.6 5.5 | 11.1 (S) 7.0 5.2 | 11.4 (S) 6.0 4.6 | 11.5 14.8 5.3 1.5 1.0 | 11 44 60 60 60 60 |
| | 331-32,3398-99 333-36 | 3.0 | 5.3 | 2.9 | 3.2 | (S) | 3.3 | 3.3 | (S) | (S) 3.0 | 1.7 (S) | 1.6 (S) |
| Fabricated metal products | 34 | (T) 79.6 | 16.6 87.0 | (S) | (S) 89.7 | 9.9 | 10.5 | 9.9 | 10.1 | (S) 109.7 | 8.7 99.3 | 8.2 99.4 |
| Office, computing, and accounting machines | 357 351-56,358-59 | 52.6 27.0 | 56.5 30.5 | 61.8 | 71.9 | 73.4 | 74.4 | 75.0 25.4 | 84.7 28.6 | 77.6 32.1 | 67.1 | 66.6 32.8 |
| Electrical equipment | 36 | 108.6 | 113.2 | 113.2 | 117.9 | 130.4 | 132.5 | 122.5 | 105.2 | 95.9 | 91.9 | 90.5 |
| Radio and TV receiving equipment | 365 366 367 361-64,369 | (T) 48.8 25.6 (T) | 59.3 (T) | (S) 62.2 29.2 17.9 | 1.8 65.0 (S) 16.5 | 1.2 71.9 43.7 13.6 | 1.3 73.1 44.3 (S) | 1.5 58.0 42.8 (S) | 0.8 47.1 (S) 21.3 | 1.0 35.8 32.6 (S) | 31.2 28.4 31.2 | 1.0 (S) 29.5 29.1 |
| Transportation equipment | 37 | 134.3 | E | 160.3 | 179.2 | 187.3 | 188.2 | 185.4 | 170.2 | 149.7 | 141.1 | 144.7 |
| Motor vehicles and motor vehicles equipment Other transportation equipment | 373-75,379 372,376 | 29.0 2.2 103.1 | 28.6 (T) 111.5 | 28.7 (S) 130.2 | 33.9 (S) 144.8 | 46.5 (S) 136.3 | 47.3 (S) 136.4 | 45.8 (S) 134.8 | 49.4 (S) 115.3 | 45.3 (S) 100.2 | 44.5 (S) 92.9 | 45.2 (S) 95.0 |

See explanatory information and SOURCE at end of table.

Table A-39. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and size of company: 1983-93

| | | | | | | | | - | - | | | Page 2 of 2 |
|--|---|--------------|-------------|-------|------------|-------|----------------|-------|-------------|-------------|-------|---------------|
| Industry and size of company | SIC code | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
| | | | | | | | [In thousands] | | | | | |
| Distribution by industry: | <u> </u> | | | | | | | | | | | |
| Professional and scientific instruments | 38 | ε | E | (S) | (S) | (S) | (S) | (S) | (S) | (S) | (S) | (S) |
| Scientific and mechanical measuring instruments. | 381-82 | E | Ε | (S) | (S) | (S) | (S) | (S) | (S) | (S) | (S) | (S) |
| Optical, surgical, photographic, and other instruments | 384-87 | ε | E | 19.8 | 24.0 | 24.6 | 24.9 | 14.5 | 8.1 | (S) | (S) | 21.0 |
| Other manufacturing industries 1/Nonmanufacturing industries | 27,31,39 | 5.9 | E | (S) | (S) | 6.3 | 6.4 | 5.4 | 5.6 | (S) | 6.0 | 5.9 |
| | 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 | 31.2 | 49.8 | 66.8 | 75.1 | 96.4 | 101.9 | 125.2 | (8) | (8) | 202.6 | 211.0 |
| Distribution by size of company [Based on number of employees] | | | | | | | | | | | | |
| 7 Total (January) | | 540.9 | 584.1 | 622.5 | 671.0 | 695.8 | 708.6 | 722.5 | 743.6 | 773.4 | 779.3 | 787.1 |
| Fewer than 500 2/ | | 52.7 N/A | 81.9 A/N | 78.3 | <u>(6)</u> | 105.2 | 109.0 | 105.4 | (S) 18.6 | (S) 18.6 | 142.1 | 140.3 48.5 |
| | | 48.3 | 52.6 | 61.6 | 66.7 | 76.4 | 81.9 | 76.1 | 75.4 | | 94.2 | 102.6 |
| 5,000 to 9,999. | | 29.8 84.3 | 30.1 | 28.5 | 38.9 | 92.0 | 94.5 | 87.0 | 73.9 | | 9.76 | 38.7 103.8 |
| | | 325.8 | 335.5 | 347.6 | 365.3 | 363.3 | 363.7 | 388.7 | 404.2 | | 339.3 | 333.2 |
| | | | | | | | | | | | | |

^{1/} Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries." 2/ Data for 1982-83 are for companies with fewer than 1,000 employees. 3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY:

 ⁽S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data not separately available, but are included in total.
 N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-40. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1982-92

| Page 1 of 2 | 1992 | \$154,900 | | 143,500 94,100 137,300 116,100 | 181,600 217,400 145,700 | 203,300 89,800 111,100 110,600 | 136,400 (S) | 125,400 152,300 | 172,900 110,300 | 148,600 | 94,400 (S) 126,900 158,600 | 185,300 | 222,400 (S) 171,600 |
|-------------|------------------------------|-----------|--------------------------|--|------------------------------------|---|--------------------------------|---------------------------|--|----------------------|-------------------------------------|--------------------------|---|
| | 1991 | \$148,600 | | 130,000 (D) (D) 167,600 | 181,000 (D) (D) | 217,000 (D) (D) 142,200 | <u> </u> | 115,500 | <u>0</u> 0 | 147,100 | 0000 | 189,400 | (D) (D) 177,000 |
| | 1990 | \$141,300 | | (D) (D) (D) (D) (D) (D) | <u>@</u> | 201,800 (D) (D) | <u>0</u> 0 | (S) 138,500 | <u>0</u> 0 | 142,800 | (D) (T77,100 (D) (D) | 215,700 | (D) (D) 213,700 |
| | 1989 | \$134,500 | | (D) (D) (D) (D) (D) | <u>©</u> 00 | 194,000 (D) (S) | <u>0</u> 0 | (S) 130,000 | <u></u> <u> </u> | 132,400 | (D) 170,600 (D) (D) | 211,700 | (D) (D) 207,300 |
| | 1988 | \$132,300 | | (D) | <u>©</u> | 182,700 (D) (D) 118,600 | <u>@</u> @ | 88,100 (D) | <u>0</u> 0 | 124,100 | 160,300 (D) | 195,600 | (D) (D) 193,300 |
| | 1987 | \$128,800 | | (S) (D) (S) (D) 125,000 | <u>@</u> | 187,400 (D) 122,500 131,500 | <u>0</u> 0 | 76,600 (D) | (D) 98,300 | 124,300 | 97,900 155,300 98,400 (S) | 183,400 | (D) (S) 180,400 |
| | 1986 | \$128,500 | | (D) (S) (S) (D) (D) (T7,100 | 150,200 113,600 83,100 | (D) 118,000 (D) | (D) 138,800 | (S)(Q) | (D) 119,200 | 120,700 | 88,700 141,300 (D) | 170,700 | (D) (S) 149,800 |
| | 1985 | \$130,200 | | (D) 116,300 (D) 116,300 | 144,600 (D) (D) | 0000 | (D) 136,400 | 112,900 | <u>0</u> 0 | 124,900 | (D) 147,800 114,100 (D) | (D) | 223,100 (D) 161,700 |
| | 1984 | \$124,000 | | (D) 115,400 (D) 112,500 | 132,000 (D) | <u> </u> | (D) 112,000 | 111,600 | <u>ê</u> ê | 121,700 | (D) 143,000 100,500 (D) | <u>(D)</u> | 211,400 (D) 156,000 |
| | 1983 | \$116,000 | | (D) (S) (S) (D) (D) (D) | 123,100 103,100 (D) | (D) 75,400 (D) 129,900 | <u>0</u> 0 | (S) 108,400 | <u>0</u> 0 | 114,300 | 105,300 135,000 (S) (D) | (<u>0</u>) | 184,700 114,200 143,600 |
| | 1982 | \$111,600 | | (D) (D) 70,800 102,500 | 122,100 (D) (D) | (D) (D) (D) 118,200 | <u>0</u> 0 | (S) 103,800 | <u>@@</u> | 100,000 | (D) 123,300 69,600 (D) | <u>(a)</u> | 162,600 (D) 148,800 |
| | SIC code | | | 20,21 22,23 24,25 26,25 26 | 281-82,286 283 284-85,287-89 | 13,29 30 32 33 | 331-32,3398-99 333-36 | 34 | 357-56,358-59 | 36 | 365 366 367 361-64,369 | 37 | 373-75,379 372,376 |
| | Industry and size of company | Total | Distribution by industry | Food, kindred, and tobacco products 1/ | Industrial chemicals | Petroleum refining and extraction | Nonferrous metals and products | Fabricated metal products | Office, computing, and accounting machines | Electrical equipment | Radio and TV receiving equipment | Transportation equipment | Motor vehicles and motor vehicles equipment |

See explanatory information and SOURCE at end of table.

Table A-40. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1982-92

| Page 2 of 2 | 1991 1992 | (s) (s) | (S) (S) | (S) (S) | (D) 109,900 137,400 145,600 | | 103,400 102,600 178,700 176,100 119,400 125,600 | | |
|-------------|--------------------------|---|---|--|--|--|---|-------------------------------------|----------------|
| | 1990 | (S) | (S) | (S) | (S) | | (S) (S) 91,400 | | |
| | 1989 | (S) | (S) | (S) | (S) (S) | | 66,200 98,200 101,900 | 102,500 | 168,200 |
| - | 1988 | (S) | (S) | 316,700 | (D) 74,900 | | 67,100 (S) 100,600 | 100,400 | 160,700 |
| | 1987 | (S) | (D) | <u>Q</u> | (D) 69,100 | | 66,800 92,600 91,900 | 102,900 | 157,700 |
| | 1986 | (S) | <u>(a)</u> | <u>O</u> | (S) 86,800 | | 70,600 103,400 106,400 | 108,400 | 154,300 |
| | 1985 | \$122,000 | Q) | <u>0</u> | (D) 94,600 | | (S) (S) 97,300 | 119,300 | 155,300 |
| | 1984 | \$116,900 | Q) | Q) | (D) 84,100 | | 55,000 87,200 96,700 | 111,000 | 143,000 |
| | 1983 | (S) | 83,200 | 141,100 | 98,500 | | 65,700 N/A 82,800 | 93,400 | 134,200 |
| | 1982 | (S) | <u>Q</u> | (D) | (D) 84,800 | | 62,800 N/A 84,800 | 82,900 98,500 | 128,900 |
| | SIC code | 38 | 381-82 | 384-87 | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81 | 83-84, 87, 89 | | | |
| | Distribution by industry | Professional and scientific instruments | Scientific and mechanical measuring instruments | optical, sugical, priotographic, and other instruments | Other manufacturing industries 1/ | Distribution by size of company [Based on number of employees] | Fewer than 500 2/. 500 to 999 3/. 1,000 to 4,999. | 5,000 to 9,999 10,000 to 24,999. | 25,000 or more |

^{1/} Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries." 2/ Data for 1982-83 are for companies with fewer than 1,000 employees. 3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 N/A = Not available

NOTES: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier years, and the ratio is attributed to the earlier year. As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

Table A-41. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1992

| SIC code | | Total | Fewer than | 500 to | 1,000 to | 5,000 to | 10,000 to | 25,000 or |
|---|------------------------------------|--|---|-----------------------------------|--|--|--------------------------------------|----------------------------------|
|) | | | 500 employees | employees | 4,999 employees | seakoldma | 24,999 employees | more |
| Total | | \$154,899 | \$102,615 | \$176,098 | \$125,603 | \$148,392 | \$163,762 | \$180,953 |
| Food, kindred, and tobacco products | 20,21 22,23 24,25 | 143,535 94,114 137,328 116,145 | 159,690 125,877 98,809 140,594 | (S) 95,336 96,230 84,390 | 77,932 90,503 98,544 111,379 | 107,041 (S) 177,432 131,225 | <u>©</u> | 199,226 (D) (D) 111,715 |
| industrial chemicals | 281-82,286 283 284-85,287-89 | 191,251 181,576 217,360 145,730 | 56,838 167,249 80,318 | (D) (D) | 156,021 (S) 103,180 | 165,596 152,892 200,252 138,391 | 193,754 (S) 208,510 134,828 | 246,979 (D) (D) |
| Petroleum refining and extraction | 13,29 30 32 33 | 203,284 89,793 111,100 110,557 | 106,489 44,968 57,574 92,801 | 0000 | 144,652 195,667 83,887 104,937 | (D) (S) (D) 178,810 | 220,739 97,058 114,194 (D) | 216,779 (D) (D) (D) |
| | 331-32,3398-99 333-36 | 136,413 (S) | 94,436 | 88,621 (S) | 89,062 117,170 | 160,589 (S) | <u> </u> | <u>(a)</u> |
| | 35 | 125,367 152,320 | 158,884 84,566 | 98,296 112,921 | 89,318 112,688 | 140,838 | (S) 163,428 | 0 184,977 |
| ю | 357 351-56,358-59 | 172,895 110,284 | 113,074 77,037 | 124,089 | 129,574 99,073 | 180,163 (S) | (D) 163,682 | (D) 172,216 |
| | 36 | 148,572 | 93,563 | 109,783 | 119,966 | 134,964 | 156,623 | 189,375 |
| Radio and TV receiving equipment | 365 366 367 361-64,369 | 94,443 (S) 126,923 158,575 | 60,208 105,572 97,314 76,704 | (D) 87,274 132,156 (D) | 125,375 109,318 132,376 112,697 | 0 0 146,248 (S) | (D) (D) 116,340 | 0000 |
| Transportation equipment | 37 | 185,306 | 68,176 | 139,098 | 111,569 | 110,154 | 154,904 | 194,396 |
| Motor vehicles and motor vehicles equipment | 373-75,379 372,376 | 222,408 (S) 171,587 | 57,002 63,905 62,427 | 92,270 205,448 151,884 | 105,617 83,345 116,070 | (D) 87,391 | (D) (D) 171,370 | (D) (D) 175,214 |

See explanatory information and SOURCE at end of table.

Table A-41. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1992

| | | | | | | | | Page 2 of 2 |
|--|--------------------------------|---------|--------------------------------|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
| | | | | | Size of company | отрапу | | |
| Industry | SIC code | Total | Fewer than 500 employees | 500 to 999 employees | 1,000 to 4,999 employees | 5,000 to 9,999 employees | 10,000 to 24,999 employees | 25,000 or more employees |
| Professional and scientific instruments | 38 | (S) | \$69,707 | \$147,326 | \$112,760 | (S) | (S) | (S) |
| Scientific and mechanical measuring instruments Optical. surgical. photographic. and other | 381-82 | (S) | 82,049 | 132,712 | 106,259 | (D) | (a) | (S) |
| instruments. | 384-87 | (s) | (8) | 163,919 | 126,188 | (Q) | <u>(a)</u> | (S) |
| Other manufacturing industries | u) | 109,891 | 123,295 | 95,309 203,907 | 111,047 | (D) 145,978 | (D) 123,118 | (D) 164,318 |
| | 78-79, 80-81, 83-84, 87, 89 | | | | | | | |

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier years, and the ratio is attributed to the earlier year.

Table A-42. Cost per R&D scientist or engineer in R&D-performing companies ranked by size of R&D program: 1982-92

| | | | | | | | - | | | Page 1 of 1 |
|--|--|--|--|--|--|--|--|--|--|---|
| | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| \$182,800 127,600 127,500 104,200 98,000 99,200 86,900 | \$185,200 154,000 117,800 118,800 96,300 86,400 | \$202,000 167,000 127,800 121,000 130,400 108,900 97,300 | \$225,800 176,200 132,500 144,000 124,100 122,800 94,100 | \$225,900 171,400 131,200 125,600 139,000 146,700 | \$222,600 196,900 141,600 146,300 128,700 128,600 | \$226,200 210,700 153,000 154,500 141,300 137,300 | \$218,100 225,800 148,700 132,500 145,400 141,900 | \$219,600 249,000 129,100 145,800 164,200 137,000 | \$213,200 223,700 159,900 (S) 170,500 169,000 | \$209,800 221,000 171,600 (S) 179,800 173,900 136,000 |
| 118,500 | 125,400 | 139,000 | 144,400 | 160,400 | 153,100 | 160,600 | 161,500 | 161,200 | 169,000 | 175,700 |

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier years, and the ratio is attributed to the earlier year. The cardier years are assult of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

Table A-43. Domestic employment of R&D-performing companies, by industry and size of company: 1991-92

| | | | | | Size of company | трапу | | Page 1 of 3 |
|---|------------------------------------|--------------------------|---|----------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
| Industry | SIC code | Total | Fewer than 500 employees | 500 to 999 employees | 1,000 to 4,999 employees | 5,000 to 9,999 employees | 10,000 to 24,999 employees | 25,000 or more employees |
| | | | | | [in thousands] | | | |
| | | | | | 1991 | | | |
| Total | | 16,963 | 1,938 | 572 | 2,440 | 1,725 | 2,970 | 7,318 |
| Food, kindred, and tobacco products. Textiles and apparel. | 20,21 | 1,023 | 43 | 27 | 149 | 139 | 188 (D) | 477 |
| Lumber, wood products, and furnifure Paper and allied products Chemicals and allied products | 24,25 26 28 | 264 577 1,203 | 42 15 145 | 14 34 41 | 70 58 186 | 41 58 128 | (D) 172 406 | (D) 240 297 |
| Industrial chemicals Drugs and medicines Other chemicals | 281-82,286 283 284-85,287-89 | 491 391 321 | 14 82 49 | 48 (D) (D) | 69 | 57 22 49 | 164 171 72 | 6 (C) |
| Petroleum refining and extraction. Rubber products Stone, clay, and glass products. | 13,29 30 32 33 | 441 388 234 451 | 117 117 255 38 | " <u>6</u> 66 | 26 110 141 | 22 26 29 81 | 78 38 95 124 | (D) (D) 88 (D) (D) 88 |
| Ferrous metals and products | 331-32,3398-99 333-36 | 235 216 | 14 24 | <u>0</u> 0 | 33 | 49 | 52 72 | <u> </u> |
| Fabricated metal products | 34 | 486 1,417 | 70 263 | 41 | 142 | 145 | 169 | 0 516 |
| Office, computing, and accounting machines | 357 351-56,358-59 | 526 891 | 14 249 | <u>0</u> 0 | 48 | 79 | (a) | 355 162 |
| Electrical equipment. | 38 | 1,393 | 183 | 57 | 235 | 93 | 213 | 612 |
| Radio and TV receiving equipment. Communication equipment. Electronic components. Other electrical equipment. | 365 366 367 361-64,369 | 34 321 669 | 7 2 3 4 4 5 5 6 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 | 8 2 <u>0</u> 0 | 7 42 95 91 | 0 0 4 4 4 | 600£ | 8 8 9 9 |
| Transportation equipment | 37 | 1,996 | 24 | 22 | 98 | 147 | 201 | 1,516 |
| Motor vehicles and motor vehicles equipment | 373-75,379 372,376 | 913 95 988 | 4 / 10 | 204 | 48 6 32 | (D) (C) 37 | (D) (D) (33) | (D) (D) 762 |

See explanatory information and SOURCE at end of table.

Table A-43. Domestic employment of R&D-performing companies, by industry and size of company: 1991-92

| | | | | | | | | Page 2 of 3 |
|---|---|-------------------------------------|--------------------------------|----------------------------------|--------------------------------|--------------------------------|--|---------------------------------|
| | | | | | Size of company | mpany | | |
| Industry | SIC code | Total | Fewer than 500 employees | 500 to 999 employees | 1,000 to 4,999 employees | 5,000 to 9,999 employees | 10,000 to 24,999 employees | 25,000 or more employees |
| | | | | | [in thousands] | | | |
| | | | | | 1991 | | | |
| Professional and scientific instruments | 38 | 895 | 117 | 46 | 148 | 54 | 45 | 485 |
| Scientific and mechanical measuring instruments | 381-82 | 547 | 63 | (a) | 83 | 29 | (a) | 326 |
| Optical, surgical, photographic, and other instruments | 384-87 | 348 | 54 | (a) | 65 | 25 | (Q) | 159 |
| Other manufacturing industries | 27,31,39 07-10, 12-17, | 412 5,375 | 727 | 18 | 66 | 51 | 71 | 76 2490 |
| | 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 | | | | | | | |
| | 1 | | | | 1992 | | | |
| leto1 | | 16,632 | 1,855 | 585 | 2,463 | 1,742 | 2,923 | 7,064 |
| Food, kindred, and tobacco products Textiles and apparel Lumber, wood products, and furniture Paper and allied products Chemicals and allied products | 20,21 22,23 24,25 26,26 26 | 1,023 411 273 571 1,150 | 54 7 1 4 4 3 4 1 3 6 | 28 22 15 15 35 42 | 152 114 76 57 | 137 45 42 61 127 | 187 (D) (D) (D) 169 399 | 465 (D) (D) 235 276 |
| Industrial chemicals | 281-82,286 283 284-85,287-89 | 454 376 320 | 15 69 52 | 7+ (0) (0) | 67 41 62 | 54 24 49 | 152 181 66 | (D) (D) |
| Petroleum refining and extraction. Rubber products. Stone, clay, and glass products. Primary metals. | 13,29 30 32 33 | 406 393 232 447 | 116 116 255 36 | ~ <u>666</u> | 24 112 42 106 | 22 27 29 83 | 71 39 93 117 | 274 (C) (C) (C) |
| Ferrous metals and products | 331-32,3398-99 333-36 | 232 215 | 12 24 | (O) | 37 | 31 | 70 70 | (Q) |

See explanatory information and SOURCE at end of table.

Table A-43. Domestic employment of R&D-performing companies, by industry and size of company: 1991-92

| | | | | | Size of company | отрапу | | |
|---|---|-------------------------|--------------------------------|---|--------------------------------|--------------------------------|----------------------------------|--|
| Industry | SIC code | Total | Fewer than 500 employees | 500 to 999 employees | 1,000 to 4,999 employees | 5,000 to 9,999 employees | 10,000 to 24,999 employees | 25,000 or more employees |
| | | | | | [in thousands] | | 1 | |
| | <u> </u> | | | | 1992 | | | |
| Fabricated metal products | 35 | 1,347 | 84 247 | 42 | 139 | 63 141 | 172 | 0 |
| Office, computing, and accounting machines | 357 351-56,358-59 | 479 868 | 14 233 | <u> </u> | 48 220 | 76 65 | <u>0</u> 0 | 309 |
| Electrical equipment | 36 | 1,382 | 185 | 59 | 234 | 96 | 214 | 594 |
| Radio and TV receiving equipment | 365 366 367 367-64,369 | 36 366 317 663 | 7 37 84 84 | (D) 574 574 574 574 574 574 574 574 574 574 | 8 43 91 92 | 0 0 49 47 | 11000 | (D) (D) 323 |
| Transportation equipment | 37 | 1,902 | 20 | 22 | 86 | 149 | 186 | 1,439 |
| Motor vehicles and motor vehicles equipment | 373-75,379 373-75,379 372,376 | 911 96 895 | 2 6 72 | ന യ ന | 52 6 28 | (D) 37 | 300 | (a) (b) (a) (a) (b) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d |
| Professional and scientific instruments | 38 | 879 | 134 | 50 | 148 | 54 | 43 | 450 |
| Scientific and mechanical measuring instruments Optical, surgical, photographic, and other | 381-82 | 525 | 75 | (a) | 81 | 26 | (a) (c) | 299 |
| Other manufacturing industries | 2 07-10, 40-42, 50-59, 60, 701, 73, 78-79, 83-84, | ហំ | 6444 | 1981 | 6239 | 89.99 | (5) 833 833 | 2,473 |

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

Table A-44. R&D scientists and engineers per 1,000 employees in manufacturing companies, by industry and size of company: 1982-92

| Page 1 of 2 | 1992 | 47 | 10 7 6 19 76 | 66 108 53 | 28 38 23 11 | ∠ (S) | 17 | 139 38 | 99 | 28 85 91 45 | 75 | 49 (S) 105 |
|---------------|------------------------------|--------------------------|---|------------------------------------|--|-----------------------------|---------------------------|--|----------------------|--|--------------------------|---|
| 4 | 1991 | 20 | 7 7 17 69 | 60 95 53 | 26 38 11 | (S) | 19 | 137 | 29 | 30 94 95 43 | 73 | (S) 98 |
| - | 1990 | 47 | 8 9 9 9 6 9 6 9 6 9 6 9 6 9 6 9 6 9 6 9 | 59 96 53 | 26 24 11 | 7 | 20 73 | 131 | 99 | 08 88 89 89 89 | 89 | 4 4 5 96 |
| | 1989 | 46 | (S) 8 13 5 69 | 56 92 60 | 26 26 26 12 | 8 9 | (S) | 126 | 99 | 44 6 9 8 8 9 9 8 9 9 8 9 9 9 8 9 9 9 9 9 9 | 77 | 41 101 |
| | 1988 | 46 | 8 (8) 2 1 2 69 | 94 60 | 24 (S) 26 12 | 9 | 17 | 114 | 77 | 45 100 26 | 72 | 41 40 103 |
| | 1987 | 45 | 7 4 5 T 8 9 | 52 98 61 | 20 19 24 12 | 91 | 17 67 | 115 | 65 | 45 73 86 28 | 68 | 42 38 91 |
| | 1986 | 45 | V 4 2 T L 0 C | 56 98 63 | 19 25 20 11 | 71 | (S) | 107 | 59 | 55 68 82 26 | 69 | 38 23 99 |
| Annual Annual | 1985 | 43 | 8 5 113 57 | 39 81 62 | 21 26 20 12 | 119 | (S) | 99 | 53 | 23 62 81 30 | 7.1 | 28 8 116 |
| | 1984 | 40 | 7 5 6 13 57 | 89 51 | 22 27 17 | 11 | (S) | 32 | 49 | (S) 26 30 30 30 30 | (S) | 27 (S) 110 |
| | 1983 | 34 | 9 4 (S) 27 25 24 4 6 | 45 (S) 39 | (S) 14 11 | 1 6 | (S) 57 | 30 | 51 | (S) (S) | N/A | 30 (S) 102 |
| | 1982 | 33 | 9 4 (S) 4 12 17 | 44 74 37 | (§) 57 12 12 12 12 13 14 15 16 16 16 16 16 16 16 16 16 16 16 16 16 | 8 £ | (S) 48 | 80 | 55 | (S) 74 66 (S) | A/X | 31 94 |
| | SIC code | | 20,21 22,23 24,25 26 26 | 281-82,286 283 284-85,287-89 | 13,29 30 32 33 | 331-32,3398-99 333-36 | 34 | 357 351-56,358-59 | 36 | 365 366 367 361-64,369 | 37 | 373-75,379 372,376 |
| | Industry and size of company | Distribution by industry | Food, kindred, and tobacco products 1/ | Industrial chemicals | Petroleum refining and extraction | Ferrous metals and products | Fabricated metal products | Office, computing, and accounting machines | Electrical equipment | Radio and TV receiving equipment | Transportation equipment | Motor vehicles and motor vehicles equipment |

See explanatory information and SOURCE at end of table.

Table A-44. R&D scientists and engineers per 1,000 employees in manufacturing companies, by industry and size of company: 1982-92

| 1992 | | | (s) (s) | | 14 14 | | 56 61 | | | | | |
|------------------------------|--------------------------|---|---|---|-----------------------------------|--|------------------|---------------|----------------|----------------|------------------|----------------|
| 1991 | | | | | | | | | | | | |
| 1990 | | 71 | 92 | 17 | 14 | | 51 | 28 | 32 | 37 | 35 | 61 |
| 1989 | | 59 | 96 | 28 | 14 | | 20 | 29 | 58 | 35 | 35 | 61 |
| 1988 | | 62 | 84 | 48 | 17 | | 20 | 59 | 26 | 33 | 33 | 59 |
| 1987 | | 71 | 85 | 63 | 18 | | 59 | 27 | 30 | 29 | 32 | 57 |
| 1986 | | (S) | (S) | 61 | (S) | | 59 | 23 | 32 | 28 | 33 | 99 |
| 1985 | | (S) | (S) | 70 | (S) | | 20 | 21 | 56 | 19 | 30 | 49 |
| 1984 | | (S) | (S) | (S) | (S) | | 42 | 21 | 24 | 19 | 53 | 47 |
| 1983 | | (S) | (S) | (S) | (S) | , | 34 | K/Z | 25 | 22 | 26 | 42 |
| 1982 | | (S) | (S) | (S) | 6 | | 30 | A/N | 22 | 23 | 56 | 43 |
| SIC code | | 38 | 381-82 | 383-87 | 27,31,39 | | | | | | | |
| Industry and size of company | Distribution by industry | Professional and scientific instruments | Scientific and mechanical measuring instruments | Optical, sugical, protographic, and other instruments | Other manufacturing industries 1/ | Distribution by size of company [Based on number of employees] | Less than 500 2/ | 500 to 999 3/ | 1,000 to 4,999 | 5,000 to 9,999 | 10,000 to 24,999 | 25,000 or more |

^{1/} Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries." 2/ Data for 1982-83 are for companies with fewer than 1,000 employees. 3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.
 N/A = Not available

NOTES: The number of R&D scientists and engineers per 1,000 employees for 1992 is derived by dividing the arithmetic mean of scientists and engineers employed in January 1991 and January 1992 by the number of employees in all activities in March 1991. Similar procedures were used for earlier years. Nonmanufacturing industries are included in pre-1983 calculations.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-45. R&D funds per employee in R&D-performing companies, by size of company: 1982-92

| | | | | | | | | | | Pa | age 1 of 1 |
|--|--|--|--|--|--|--|--|--|--|--|--|
| Size of company [based on the number of employees] | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| | | | To | otal (compar | ıy, Federal, | and other) F | R&D funds p | er employe | е | | |
| Total | \$3,719 | \$4,163 | \$4,579 | \$5,148 | \$5,153 | \$5,338 | \$5,594 | \$5,920 | \$6,291 | \$6,842 | \$7,268 |
| Fewer than 500 1/ | 1,732 N/A 1,790 1,883 2,469 5,502 | 2,186 N/A 2,042 2,194 2,966 5,785 | 2,767 2158 2,480 2,505 3,385 6,184 | 3,028 2,238 2,725 2,851 3,500 7,071 | 5,414 3,229 3,261 2,849 3,334 6,878 | 5,553 3,121 3,395 3,210 3,668 7,035 | 5,377 2,906 3,223 3,992 3,713 7,388 | 5,660 3,197 3,404 4,158 3,607 7,863 | 6,339 3,826 3,738 4,456 4,401 8,005 | 7,279 (W) 4,243 4,706 5,223 8,252 | 7,688 (W) 5,025 4,948 5,619 8,619 |
| | | | Co | mpany and | other (exce | pt Federal) | R&D funds | per employe | e | | |
| Total | \$2,534 | \$2,814 | \$3,095 | \$3,383 | \$3,503 | \$3,562 | \$3,844 | \$3,607 | \$4,401 | \$5,322 | \$5,791 |
| Fewer than 500 1/ | 1,381 N/A 1,503 1,551 2,025 3,436 | 1,749 N/A 1,687 1,613 2,351 3,637 | 2,212 1,782 2,096 2,199 2,689 3,792 | 2,407 1,700 2,316 2,409 2,769 4,208 | 4,750 2,997 2,725 2,316 2,697 4,077 | 4,811 2,859 2,799 2,682 2,969 4,010 | 4,782 2,677 2,761 3,335 3,163 4,402 | 5,201 3,029 2,990 3,624 3,217 5,016 | 5,701 3,598 3,346 4,286 3,863 5,251 | 6,242 (W) 3,817 4,228 4,106 5,739 | 6,553 (W) 4,561 4,463 4,435 6,228 |

KEY: N/A = Not available
(W) = Data have been withheld pending further review.

NOTES: Averages were derived by dividing total and company R&D funds for a calendar year by employment data for March of that year.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

^{1/} Data for 1982-83 are for companies with fewer than 1,000 employees. 2/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

Table A-46. Concentration of total employment in R&D-performing companies ranked by size of R&D program: 1986-92

[Percent] Page 1 of 1 Companies 3 5 4 9 10 10 3 5 5 9 8 4 5 6 9 7 4 6 6 8 7 6 4 8 10 10 54 All others.....

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SECTION B. TECHNICAL NOTES

Introduction

This report is the third of three publications produced from the 1992 Survey of Industrial Research and Development. The first, a Data Brief announcing the availability of survey results, contains some analytical information and describes recent changes to the survey that are discussed in detail below. The second, a Selected Data report, contains 16 of the most frequently requested tabulations and was published while this more comprehensive report was being prepared. This report, the Detailed Statistical Tables report, contains the full set of statistics produced from the survey. All three of the publications provide statistics on research and development (R&D) funding for the years 1982-92 and on R&D personnel for the period from January 1983 to January 1994.

This report provides national estimates of the expenditures on R&D performed within the United States by industrial firms, whether U.S. or foreign owned. Among the statistics, classified various ways, are estimates of total R&D, the portion of the total financed by U.S. Government funds, and the portion financed by the companies themselves (or by other non-Federal sources such as State and local governments or other industrial firms under contracts or subcontracts). Total R&D is also separated into its character-of-work components: basic research, applied research, and development. Other R&D statistics include those on the funds for R&D financed by the domestic firm but performed outside the United States and on the funds spent to perform energyrelated R&D. Also in this report are statistics on R&D-performing companies including domestic net sales, number of employees, number of R&D-performing scientists and engineers, and cost per R&D scientist and engineer.

The Survey of Industrial Research and Development is a sample survey that intends to include or represent all for-profit, nonfarm R&D-performing companies, either publicly or privately held. The survey's primary focus is on U.S. industry as a performer of, rather than as a source of funds for, R&D. Thus, data on Federal support of R&D activities performed by industry are collected and resulting statistics appear in several tables, but statistics on industrial funding of R&D undertaken at universities and colleges and

other nonprofit organizations are not collected and therefore are not included in the tables.¹

Industry statistics are developed from data collected from individual companies or enterprises. Since the survey is enterprise based rather than establishment based, all data collected for the various subparts of each enterprise (plants, divisions, or subdivisions) are tabulated in the major standard industrial classification (SIC) of the company. The resulting industry estimates are reported using the SIC of the companies within the each industry. National totals are estimated by summing the industry estimates.

All companies known, through previous surveys or through outside information sources, to spend more than \$1 million annually on R&D in the United States or to have 1,000 or more employees receive a survey questionnaire every year. Remaining firms are subjected to probability sampling and may or may not receive a questionnaire for a given survey year. Among the organizations purposely excluded from the survey are trade associations and not-for-profit consortia. Although their primary mission is to serve industry, these associations are established as non-profit organizations.

Respondents receive detailed definitions to help them determine which expenses to include or exclude from the R&D data they provide. Nevertheless, the statistics presented in this report are subject to response and concept errors caused by different respondent interpretations of the definitions of R&D activities and by variations in company accounting procedures. Consequently, the statistics are better indicators of changes in, rather than absolute levels of R&D spending and personnel.

The National Science Foundation (NSF) has sponsored a survey of industrial R&D since 1953.

¹ Data on R&D performed at universities and colleges are collected in the annual Survey of Scientific and Engineering Expenditures at Universities and Colleges. More information about this survey is available from NSF's R&D Statistics Program in the Division of Science Resources Studies at the address given in "General Notes," preceding section A.

The two surveys covering the 1953-56 period were conducted by the Bureau of Labor Statistics (BLS), U.S. Department of Labor.² Since 1957 the Bureau of the Census has conducted the survey.³ NSF's Division of Science Resources Studies sponsors and monitors the survey.

The content of the survey has been expanded and refined over the years in response to an increasing need by policymakers for more detailed information on the Nation's R&D effort. For example, questions on energy R&D were added in the early seventies, following the first oil-shortage crisis. On the other hand, the frequency of collection of certain data items has been reduced in recent years in an attempt to alleviate some of the respondent burden that has been placed on industry from all sources. For large firms known to perform R&D, a detailed questionnaire, Form RD-1L, is used to collect data for odd-numbered years and an abbreviated version, Form RD-1S, is used to collect data for even-numbered years. To further limit reporting burden on small R&D performers and on firms that are included in the sample for the first time, an even more abbreviated form, Form RD-1A, which collects only the most crucial data, is used each year. This report provides data collected from the abbreviated forms, RD-1S and RD-1A.

Several changes have been made to the survey recently that are of special importance to users of this report. Prior to the 1992 survey, statistics were based

on samples selected at irregular intervals (i.e., 1967, 1971, 1976, 1981, 1987). In intervening years a subset of the last sample (called a "panel") was used. The most recent sample prior to the 1992 survey was selected and first used for survey year 1987. Estimates for 1988 through 1991 were based on surveys of the panel of companies that reported R&D activity in the 1987 survey. Beginning with the 1992 survey, statistics are based on samples selected annually. Also, beginning with the 1992 survey, the sample size was increased from approximately 14,000 to nearly 23.400 firms. This increase was made for several reasons: (1) to better account for births of R&Dperforming establishments in the survey universe, (2) to survey more fully and accurately R&D performed by nonmanufacturing firms (especially in the service sector and by small firms in all industries), and (3) to gather more current information about potential R&D performers. In this report tables containing historical statistics are presented in two ways. For the tables in section A, estimates from the 1992 survey are linked with estimates from the 1987 survey. The linking was accomplished using an algorithm that preserved to the greatest extent possible year-to-year trends for each industry. A full explanation of the linking process used is explained in this section, under "Comparability of Statistics". Also under "Comparability of Statistics," there is a series of tables for which no attempt was made to link the estimates derived from data collected in the 1992 survey to estimates derived from data collected in previous surveys.

² See National Science Foundation, Science and Engineering in American Industry: Final Report on a 1953-54 Survey (NSF 56-16) and Science and Engineering in American Industry: 1956 (NSF 59-50) (Washington, DC: Supt. of Documents, GPO, 1956 and 1960).

³ Data obtained in the earlier BLS surveys are not directly comparable with Census figures because of methodological and other differences.

Survey Methodology⁴

Reporting Unit

The reporting unit for the Survey of Industrial Research and Development is the enterprise, or company, defined as a business organization of one or more establishments under common ownership or control. The survey includes two groups of enterprises: (i) companies known to conduct research and development (R&D) and (ii) a sample representation of companies for which information on the extent of R&D activity is uncertain.

Frame Creation

The Standard Statistical Establishment List (SSEL), a Bureau of the Census compilation that contains information on over 3 million establishments with paid employees, was the universe from which the frame used to select the 1992 survey sample was created (see table B-1 for universe and sample sizes). For companies with more than one establishment, data were summed to the company level. The firm was then assigned a single standard industrial classification (SIC) code based on the activity of the establishment(s) having the highest dollar value of payroll. This assignment was done on a hierarchical basis. The enterprise was first assigned to the economic division (manufacturing or nonmanufacturing) with the highest payroll, then to the 2-digit SIC code with the highest payroll within the assigned division, then to the 3-digit SIC code with the highest payroll within the assigned 2-digit industry.

The frame from which the survey sample was drawn included all for-profit companies classified in nonfarm industries. For surveys prior to 1992, the frame was limited to companies above certain size criteria based on number of employees. These criteria varied by industry. Also, some industries were excluded from the frame because it was believed that these industries contributed little or no R&D activity to the final survey estimates. For the 1992 sample,

new industries were added to the frame⁵ and the size criteria were lowered considerably and applied uniformly to firms in all industries. As a result, nearly 2 million enterprises with 5 or more employees were given a chance of selection. For comparison, the frame for the 1987 sample included 154,000 companies of specified sizes and industries.

External information about the likelihood that a company conducted R&D was used to identify nearly 10,000 companies that were included in the survey sample with certainty. External sources included prior R&D surveys, directories that include company information on R&D reported to the Securities and Exchange Commission, commercially available directories of R&D performing companies, Department of Defense directories of contracts awarded for R&D, and various publications and newsletters that highlight firms conducting R&D. In addition, all companies in the frame with 1,000 employees or more were selected with certainty.

Sample Selection Probability Proportionate to Size

As with most types of economic surveys, the sample was selected using probabilities proportionate to size. That is, large companies had a higher probability of selection than did small companies. For this survey it would have been ideal if company size could have been determined by the amount of R&D expenditures. Unfortunately, except for the companies that were in a previous survey or for which there was information from external sources, it was impossible to know the R&D expenditure values for firms in the universe. Consequently, most companies' R&D expenditures had to be estimated and the probability of selection, based on the estimated values.

Since total employment was known for each company in the universe, it was possible to use an already-observed relationship between employment and R&D to estimate R&D expenditure values for companies in the frame. This was the same strategy employed in the 1981 and 1987 sampling operations. For 1992 sampling, data collected in the 1991 survey was used to derive this relationship separately for single-unit

⁴ Information for this section was provided by the Industry Division of the Bureau of the Census, the collecting and compiling agent for the National Science Foundation. Copies of the technical papers cited can be obtained by contacting NSF's R&D Statistics Program in the Division of Science Resources Studies at the address given in "General Notes," preceding section A.

⁵ These industries are listed and discussed under "Comparability of Statistics," later in this section.

Table B-1. Number of companies in the universe and sample: 1992

| pe pe | R&D for questionnaire, 1992 RD-IS | 5,008 | | 4,025 | | 149 60 125 33 154 24 74 34 | 82 86 42 196 56 | 41 46 146 101 146 101 146 146 146 | 76 25 70 23 | 258 62 797 218 | 136 62 661 156 | 763 188 | _ | 22 209 282 250 73 | |
|----------------------------------|---|-----------|---------------|---------|--------------------------|--|--------------------------------------|---|-----------------------------|---------------------------|--|----------------------|--|-------------------------------|--------------------------|
| | the sample R& with certainty 1 | 11,158 | | 5,121 | | 267 361 200 105 329 | 76 102 151 | 166 70 164 145 314 | 150 | 306 | 162 | 692 | 29 | 221 306 | 221 306 206 |
| Number of companies selected for | the probability portion of the sample | 12,218 | | 6,697 | | 115 296 1,590 117 248 | 25 3 220 | 604 105 101 269 286 | 181 | 357 | 865 | 977 | 25 186 235 | 330 | 330 |
| Number of companies in the | universe | 1,775,985 | | 196,702 | | 10,501 16,357 22,745 3,152 5,127 | 874 745 3,508 | 6,500 640 8,568 7,350 3,323 | 1,419 | 22,154 30,780 | 1,283 | 968'6 | 396 1,012 3,869 | 4,119 | 4,119 5,633 |
| SIC code | | | | | | 20,21 22,23 24,25 24,25 26 28 | 281-82,286 283 . 284-85,287-89 | 33 33 33 33 33 33 33 33 33 33 33 33 33 | 331-32,3398-99 | 34 | 357 351-56,358-59 | 36 | 365 366 367 | | |
| Industry | | Total | MANUFACTURING | Total | Distribution by industry | Food, kindred, and tobacco products | Industrial chemicals | Oil and Gas Extraction | Ferrous metals and products | Fabricated metal products | Office, computing, and accounting machines | Electrical equipment | Radio and TV receiving equipment Communication equipment Electronic components Other electrical equipment | | Transportation equipment |

See SOURCE at end of table.

Table B-1. Number of companies in the universe and sample: 1992

| Page 2 of 2 | Number of companies sent a long questionnaire, RD-IS | 85 | 52 | 32 | | 272 | +00 to + | @O4#N | 15 37 62 5 | 2 74 |
|-------------|--|---|-------------|--------------------------------|------------------|-----------|--------------------------------------|--|--|---|
| | | 278 | 241 | 191 | | 983 | 01 to 4 to to | <u> </u> | 26 87 195 85 205 | 32 287 |
| | Number of companies that reported R&D for 1992 | * | т. | 10 | | | 29 20 15 17 | 15 448 16 | 84 35 90 40 | 80 00 |
| | Number of companies selected for the sample with certainty | 244 | 263 | 425 | | 6,037 | 29 20 20 115 17 | <u>-</u> ω44- | 84 159 535 1,190 340 | 58 3426 |
| | Number of companies selected for the probability portion of the sample | 137 | 175 | 902 | | 5,521 | 255 102 54 5 69 | 325 325 103 377 10 | 13 35 1,265 954 201 | 456 1267 |
| | Number of companies in the universe | 2,722 | 2,814 | 38,940 | | 1,579,283 | 26,906 446 250 208 1,315 | 1,821 34,318 14,638 123,821 267 | 7,884 4,143 44,285 13,016 27,940 | 3,090 1,274,935 |
| | SIC code | 381-82 | 384-87 | 27,31,39 | | | 07 08 09 10 12 | 4 4 5 7 7 7 7 7 7 7 7 7 | 449 499 73 80 87 | 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 |
| | Industry | Scientific and mechanical measuring instruments | instruments | Other manufacturing industries | NONMANUFACTURING | Total | | | | |

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

companies and multiestablishment companies. The effect in all cases was to give firms with a large number of employees higher probability of selection since it was assumed that large companies were more likely to perform R&D and that the amount of R&D was proportionate to the size of the company.

Sample Stratification and Relative Standard Error Constraints

The particular sample selected was one of a large number of the same type and size that by chance might have been selected. Statistics resulting from the different samples would differ somewhat from each other. These differences are represented by estimates of sampling error. The smaller the sampling error, the more precise the statistic.

To control sampling error in the statistics resulting from this survey, parameters were specified to allocate the sample across various levels, or strata, that corresponded to industry groupings. These parameters permitted the sample size to be varied to achieve a desired level of sampling error for each stratum and were assigned so that estimated errors of total R&D for industries in these strata did not exceed certain levels. Sample sizes among the strata were only constrained by the limit placed on the total sample size dictated by the available budget.

For sample selections prior to 1992, the strata designations were the published industry categories. The sample was allocated across these industry categories to provide high, medium, and low levels of precision. For the 1992 sample the criteria for this allocation were modified. In order to gather information to review and evaluate the appropriateness of the published industry groupings, the allocation of the sample was controlled for levels of industry detail below those traditionally published. The result was that the frame was partitioned into 95 manufacturing industry strata and 25 nonmanufacturing strata.

Each industry was allocated to one of three groups. The first group was formulated to analyze the distribution of data in manufacturing industries. In this group each 3-digit manufacturing industry was considered a separate stratum. The second group was formulated to improve coverage and to identify emerging industries. In this group, selected 2-digit and 3-digit nonmanufacturing industries each were considered a separate stratum. The industries were

identified as those for which statistics had been published previously and those with high concentrations of scientists and engineers as reported in occupational surveys. The third group was a large stratum of companies in nonmanufacturing industries that had not been included in previous sampling frames or for which there was little indication of R&D activity.

Once the strata were defined, the following criteria were used to achieve the target sampling error for total R&D.

- a. Sampling error not to exceed 2 percent for: 44 3-digit manufacturing industries that contribute to a current publication level below the 2-digit industry level and 15 3-digit nonmanufacturing industries that represent a current publication level or for which there is a high concentration of scientists or engineers.
- b. Sampling error not to exceed 5 percent for: 51 3-digit manufacturing industries that are part of currently published 2-digit or aggregations of 2-digit industries; 9 2-digit nonmanufacturing industries for which R&D activity was likely, and 1 stratum of remaining nonmanufacturing industries for which there was little prior indication of R&D activity.

Based on the desired precision represented by these sampling error estimates, the criteria suggested a total sample size of approximately 23,000.

A limitation of the sample allocation process should be noted. Sampling errors were controlled by using a universe total that, in large part, was improvised. That is, as previously noted, an R&D value was assigned to every company in the frame, even though many of these companies actually may not have had R&D expenditures. The value assigned was imputed for the majority of companies in the frame and, as a consequence, the estimated universe and the distribution of individual company values did not necessarily reflect the true distribution. Estimates of sampling variability were nevertheless based on this distribution. The presumption was-and this had been confirmed using the previous sample selection-that actual variation in the sample design would be less than that estimated, because many of the sampled companies have true R&D values of zero, not the widely varying values that were imputed using total employment as a predictor of R&D. Thus, the 2percent and 5-percent error levels described earlier are conservative. (See table B-2 for a list by industry of the actual standard error estimates for total R&D.)

In addition to sampling error, the estimates are subject to nonsampling error. Errors are grouped into five categories: specification, coverage, response, nonresponse, and processing. For detailed discussions on the sources, control, and measurement of each of these types of error, see the technical reports cited below.⁶

Sample Size and Weighting

The sample was selected with a target sample size of 23,000 and with other parameters set to ensure compliance with the standard error constraints. An actual sample of 23,376 was selected. The actual sample size differed from the target for two reasons. First, the sample frame was subjected to independent sampling. Each company in the frame had an independent chance of selection, based on its assigned probability, i.e., selection of a company was completely independent of the selection of any other company. In independent sampling, sample size itself is a random variable. Theoretically, a sample of size zero or a sample the size of the entire universe is possible, but the probabilities of these extremes are so small that these are nearly impossible situations. The actual sample size is usually quite close to the specified size. If there is too much deviation, the selection is simply executed again.

Second, a minimum probability rule was imposed. As noted earlier, probabilities of selection proportionate to size are assigned to each company, where size is the imputed R&D value assigned each company. Selected companies that report actual R&D expenditures vastly larger than their assigned values can have adverse effects on the statistics, which are based on the weighted value of survey responses. To lessen the effects on the final statistics, the maximum weight a

Survey Questionnaires

Two questionnaires are used each year to collect data for the survey. For large firms known to perform R&D, a detailed questionnaire, Form RD-1L, is used to collect data for odd-numbered years and an abbreviated version, Form RD-1S, is used to collect data for the even-numbered years. The questionnaires are cycled in this manner to reduce reporting burden on survey respondents.

The Form RD-1L requests data on sales or receipts, total employment, employment of scientists and engineers, expenditures for R&D performed within the company with Federal funds and with company and other funds, character of work (basic research, applied research, and development), companysponsored R&D expenditures in foreign countries, R&D performed under contract to others, expenditures for pollution abatement and energy R&D, detail on R&D by product field, Federal R&D support to the firm by contracting agency, domestic R&D expenditures by State, and foreign R&D by country. The Form RD-1S requests the same information except for the last four items. Because companies receiving the Forms RD-1L and RD-1S generally have participated in previous surveys, computer imprinted data reported by the company for the previous year is supplied for reference. Companies are encouraged to revise or update this imprinted data if they have more current information.

To further limit reporting burden on small R&D performers and on firms that are included in the sample for the first time, an even more abbreviated form is used each year. Form RD-1A collects data only on R&D, sales, employment, and operational status and includes a screening item that allows respondents to indicate that they do not perform R&D.

company could assume was arbitrarily controlled by specifying the probability of the company's selection. If the probability, based on company size, was less than the arbitrarily set minimum, then the probability was set equal to the minimum value. The consequence of raising these original probabilities to the minimum probability was to raise the expected sample size. It is likely that most of the difference between the size of the target sample and the actually selected sample was because of this rule.

⁶ U.S. Department of Commerce, Bureau of the Census, Documentation of Nonsampling Issues in the Survey of Industrial Research and Development, RR94/03 (Washington, DC, Sept. 1994) and U.S. Department of Commerce, Bureau of the Census, A Study of Processing Error in the Survey of Industrial Research and Development, ESMD-9403 (Washington, DC, Sept. 1994)

⁷ The weight given to a company selected for the survey is the inverse of its probability of selection. Companies selected for the sample with certainty (see "Frame Creation" above) represented only themselves, and each had a weight of 1.0.

Table B-2. Standard error of estimate (percentage) of total (company, Federal, and other) funds for industrial R&D performance for all company size groups and for companies with fewer than 1,000 employees, by industry: 1992

Page 1 of 1

| | | | Page 1 of 1 |
|---|-------------------|----------------------|---|
| Industry | SIC code | Standard error 1/ | Standard error of companies with fewer than 1,000 employees |
| Total | | 4.8 | 25.3 |
| | 20.21 | 2.9 | 41.2 |
| ood, kindred, and tobacco products | 20,21 22,23 | 7.7 | 9.3 |
| extiles and apparel | 24,25 | 5.8 | 22.0 |
| umber, wood products, and furniture | 26 | 3.9 | 63.1 |
| aper and allied products | 28 | 1.4 | 18.9 |
| hemicals and allied products | | | |
| Industrial chemicals | 281-82,286 | 1.5 | 33.0 |
| Drugs and medicines | 283 | 2.4 | 43.2 |
| Other chemicals | 284-85,287-89 | 3.2 | 15.0 |
| Other chemicale | | | 05.4 |
| Petroleum refining and extraction | 13,29 | 1.4 | 35.4 |
| Rubber products | 30 | 20.2 | 53.9 |
| Stone, clay, and glass products | 32 | 1.8 | 18.8 |
| Primary metals | 33 | 2.4 | 18.3 |
| | | 2.0 | 26.7 |
| Ferrous metals and products | 331-32,3398-99 | 2.8 3.6 | 23.8 |
| Nonferrous metals and products | 333-36 | 3.0 | 25.0 |
| | 34 | 12.6 | 44.7 |
| abricated metal products | 35 | 1.6 | 14.1 |
| Machinery | 55 | | |
| Office, computing, and accounting machines | 357 | 0.0 | 0.0 |
| Other machinery, except electrical | 351-56,358-59 | 6.8 | 21.3 |
| | | 4.0 | 18.5 |
| Electrical equipment | 36 | 1.3 | 16.5 |
| - " ' | 365 | 5.8 | 23.1 |
| Radio and TV receiving equipment | 366 | 1.4 | 12.6 |
| Communication equipment | 367 | 4.3 | 11.4 |
| Other electrical equipment | 361-64,369 | 1.0 | 13.9 |
| Other electrical equipment | | | |
| Fransportation equipment | 37 | 0.1 | 17.1 |
| Talloportation ogsipment | | | 0.0 |
| Motor vehicles and motor vehicles equipment | 371 | 0.0 | 7.2 |
| Other transportation equipment | 373-75,379 | 0.5 0.1 | 23.6 |
| Aircraft and missiles | 372,376 | 0.1 | 20.0 |
| | 38 | 2.1 | 12.0 |
| Professional and scientific instruments | 30 | | |
| Scientific and mechanical measuring instruments | 381-82 | 1.0 | 5.6 |
| Optical, surgical, photographic, and other | | | |
| instruments | 384-87 | 4.6 | 23.9 |
| | | 40.4 | 28.3 |
| Other manufacturing industries | 27,31,39 | 10.1 19.2 | 40.3 |
| Nonmanufacturing industries | 07-10, 12-17, | 19.2 | 40.0 |
| | 40-42, 44-49, | | |
| | 50-59, 60-65, 67, | | |
| | 701, 73, 75-76, | | |
| | 78-79, 80-81, | | |
| İ | 83-84, 87, 89 | | |

^{1/} A description of the standard error of estimate is given under "Methodology of Survey." The percentage (or relative) standard errors in this table may be converted to standard errors of estimate by multiplying the percentages shown by the associated estimates. For example, since the relative standard error of estimate for R&D performance for all company size groups in the chemicals industry (SIC 28) is 1.4 percent, and the associated total R&D estimate for this industry is \$16,711 million, the standard error of estimate is .014 times 16,711 or 234.

No prior-year information is available since the majority of the companies have not reported previously.8

For the 1992 survey, about 1,600 companies received Form RD-1S and nearly 22,000 received Form RD-1A. Of the 22,000 firms, 1,760 reported R&D expenditures. Both questionnaires and the instructions provided to respondents are reproduced in section C, Survey Documents.

Followup for Survey Nonresponse

The 1992 survey questionnaires were mailed in May 1993, and recipients were asked to respond within 60 days. Thirty days later, letters were mailed to all survey recipients reminding them that their completed questionnaire was due within the next 30 days. After 60 days, followup letters were sent to all nonresponding firms. Two additional followup mailings were made to persistent nonrespondents, after 90 and 120 days. The 90-day followup mailing included a replacement questionnaire.

In addition to the mailings, telephone followup was used to encourage response from those firms ranked among the 300 largest R&D performers, based on total R&D expenditures reported in the previous survey. Telephone followup was also used for these firms during the initial data edit phase of survey operations if data items were missing or unclear.

Imputation for Item Nonresponse

For various reasons, many firms chose to return the survey questionnaires with one or more blank items.⁹ For instance, the internal accounting procedures of the firm may not have allowed it to quantify the pollu-

8 For the 1992 survey, companies were asked to report R&D expenditures for both the current and previous years. For subsequent years, only current-year data will be requested.

tion-abatement expenditures portion of R&D. In addition, some firms, as a matter of policy, refused to answer any voluntary questions.¹⁰

When respondents did not provide the requested information, estimates for the missing data were made using imputation algorithms. In general, the imputation algorithms computed values for missing items by applying the average percentage change for the target item in the nonresponding firm's industry to the item's prior-year value for that firm, reported or imputed. This approach, with minor variation, was used for most items.¹¹ Table B-3 contains imputation rates for the principal survey items.

Character of work

Response to questions about character of work (basic research, applied research, and development) declined in the mid-1980s and, as a result, imputation rates increased. The general imputation procedure described above became increasingly dependent upon information imputed in prior years, thereby distancing current-year estimates from any reported information. Because of the increasing dependence on imputed data, NSF chose not to publish character-of-work estimates in 1986. Consequently, the imputation procedure used to develop these estimates was revised in 1987 for use with 1986 and later data and differs from the general imputation approach. The new method calculates the character-of-work distribution for a nonresponding firm only if that firm reported a distribution within a 5-year period, extending from 2 years before to 2 years after the year requiring imputation. Imputation for a given year is initially performed in the year the data are collected and is based on a character-of-work distribution reported in either of the 2 previous years, if any. It is again performed using new data collected in the next 2 years. Thus, character-of-work estimates are revised as newly

⁹ For detailed discussions on the sources, control, and measurement of error resulting from item nonresponse, see the technical report: U.S. Department of Commerce, Bureau of the Census, Documentation of Nonsampling Error Issues in the Survey of Industrial Research and Development, RR94/03 (Washington, DC, Sept. 21, 1994). For a general discussion of the problems stemming from item nonresponse, see the technical report: National Science Foundation, Estimating Basic and Applied Research and Development in Industry: A Preliminary Review of Survey Procedures, NSF 90-322 (Washington, DC, 1990).

¹⁰ All but four items—total R&D, Federal R&D, net sales, and total employment—which are included in the Census Bureau's annual mandatory statistical program, are voluntary. See further discussion under "Response Rates" and "Mandatory Versus Voluntary Reporting," below.

¹¹ For detailed descriptions and analyses of the imputation methods and algorithms used, see the technical report: U.S. Department of Commerce, Bureau of the Census, *An Evaluation of Imputation Methods for the Survey of Industrial Research and Development*, ESMD-9404 (Washington, DC, Sept. 1994).

Table B-3. Imputation rates for selected items, by industry: 1992

[Percent]

| | | | | [Percent] | | | | | | Page 1 of 2 |
|---|-------------------------------------|---|---------------------------------|--------------------------------------|----------------------------------|--------------------------------------|----------------------------|----------------------------------|-------------------------------------|------------------------------------|
| | | Sal | Sales and Employment | nt | Resea | Research and Development | ant | ŏ | Selected R&D Data | |
| Industry | SIC code | Net sales | Total em- ployment | Scientists/ engineers | Total R&D | Company R&D | Federal R&D | Energy R&D | Pollution abatement | Foreign R&D |
| Total | | 2.7 | 0.9 | 27.4 | 5.2 | 27.7 | 30.0 | 47.5 | 51.9 | 6.7 |
| Food, kindred, and tobacco products | 20,21 22,23 24,25 26 26 | 4.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0 | 6.6 7.5 0.7 4.9 4.8 | 31.6 33.2 31.0 24.2 30.4 | 6.0 0.0 8.0 4.5 7.2 | 22.8 18.9 22.0 25.1 31.3 | 59.0 0.0 0.0 76.6 | 0.0 1/ 0.0 98.3 87.7 | 8.5 100.0 0.0 33.7 21.5 | 0.00 0.00 0.00 0.00 1. |
| Industrial chemicals | 281-82,286 283 284-85,287-89 | 9.5 1.7 3.4 | 7.9 2.3 3.5 | 31.1 34.5 18.7 | 6.3 0.8 1.9 | 31.0 37.5 9.4 | 75.7 61.9 90.4 | 88.8 0.0 1.1 | 27.4 4.9 9.4 | 0.0 1.6 0.9 |
| Petroleum refining and extraction | 13,29 30 32 33 | 3.9 3.7 2.3 6.7 | 2.9 4.4 2.1 5.3 | 26.2 27.9 42.1 43.9 | 0.3 7.0 4.0 8.71 | 34.8 44.4 11.6 28.3 | 0.9 0.0 95.6 56.6 | 48.4 0.0 15.4 8.5 | 5.9 15.9 0.0 | 0.0 2.3 9.1 |
| | 331-32,3398-99 333-36 | 1.1 | 1.1 | 20.5 | 0.7 28.7 | 7.5 | 0.0 | 8.8 | 0.0 | 0.0 |
| O Fabricated metal products | 34 | 2.1 | 2.1 | 25.3 | 3.3 | 21.6 | 21.3 | 98.3 | 47.8 58.8 | 3.1 |
| Office, computing, and accounting machines | 357 351-56,358-59 | 1.5 9.7 | 0.9 6.7 | 23.4 | 6.8 | 28.5 | 0.0 | 2.5 | 21.2 63.4 | 2.5 6.4 |
| Electrical equipment | 36 | 7.8 | 9.5 | 33.8 | 10.1 | 29.7 | 13.6 | 0.2 | 1.5 | 33.9 |
| Radio and TV receiving equipment | 365 366 377 361-64,369 | 3.0 19.3 4.6 5.8 | 6.2 17.2 3.9 8.8 | 12.2 64.4 18.7 17.5 | 7.8 20.5 2.3 5.3 5.3 | 7.8 36.5 31.4 19.6 | 0.0 26.8 11.3 3.8 | 0.0 | 12.4 0.0 0.0 | 46.6 84.1 16.2 4.1 |
| Transportation equipment | 37 | 6.2 | 7.3 | 3 23.6 | 3.8 | 36.7 | 49.0 | 64.3 | 72.7 | 1.5 |
| Motor vehicles and motor vehicles equipment. Other transportation equipment. Aircraft and missiles. | 373-75,379 372,376 | 7.1 0.2 0.2 6.0 | 8.5 0.2 7.0 | 42.0 93.7 11.6 | 7.9 | 41.5 82.0 27.5 | 1.0 100.0 52.6 | 97.5 1/ 61.0 | 87.9 1/ 12.5 | 0.0 |

See explanatory note and source at end of table.

Table B-3. Imputation rates for selected items, by industry: 1992

| ercent | |
|--------|--|
| | |

| | | | | | | | | | | Page 2 of 2 |
|--|--|--------------|-----------------------|--------------------------|--------------|--------------------------|----------------|---------------|------------------------|----------------|
| | | Sal | Sales and Employment | ŧ | Resek | Research and Development | ent | σ | Selected R&D Data | |
| Industry | SIC code | Net sales | Total em- ployment | Scientists/ engineers | Total R&D | Company R&D | Federal R&D | Energy R&D | Pollution abatement | Foreign R&D |
| Professional and scientific instruments | 38 | 1.6 | 1.4 | 53.7 | 1.6 | 27.4 | 21.6 | 79.2 | 1.2 | 1.8 |
| Scientific and mechanical measuring instruments | 381-82 | 2.1 | 4.1 | 57.6 | 2.0 | 20.5 | 22.2 | 79.4 | 3.7 | 9.7 |
| optical, surgical, protographic, and other instruments | 383-87 | 1.1 | 1.3 | 43.4 | 1.2 | 32.3 | 6.7 | 0.0 | 0.0 | 0.1 |
| Other manufacturing industries | 21,27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, | 1.4 | 0.9 | 26.7 | 7.8 | 13.0 | 0.0 8: | 100.0 39.0 | 54.8 | 1.0 52.0 |
| | 83-84, 87, 89 | | | | | | | | | |

6 1/ No basis for imputation.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

reported information becomes available and are not final for 2 years following their initial publication.

If no reported data are available for a firm, character-of-work estimates are not imputed. As a consequence, only a portion of the total estimated R&D expenditures are distributed at the firm level. Those expenditures not meeting the requirements of the new imputation methodology are placed in a "not distributed" category. Tables B-4 through B-8 show the character-of-work estimates along with the "not distributed" component for 1988-92, respectively.

NSF's objective in conducting the survey has always been to provide estimates for the entire population of firms performing R&D in the United States, however, the revised imputation procedure would no longer produce such estimates because of the "not distributed" component. So, a baseline estimation method was developed to allocate the "not distributed" amounts among the character-of-work components. In the baseline estimation method, the "not distributed" expenditures are allocated, by industry group, to basic research, applied research, and development categories, using the percentage splits in the distributed category for that industry. The allocation is done at the lowest level of published industry detail only; higher levels are derived by aggregation (just as national totals are derived by aggregation of individual industry estimates), and results in higher performance shares for basic and applied research and lower estimates for development's share than would have been calculated using the previous method.12 The estimates of basic research, applied research, and development provided in section A of this report were calculated using the baseline estimation method.

Response Rates and Mandatory Versus Voluntary Reporting

Detailed unit and item response rates are shown in tables B-9 and B-10, respectively. Table B-9 shows the number of companies in each industry or group of industries that received a questionnaire and the percentage that responded to the survey. Table B-10 shows the percentage of firms with R&D expenditures that also reported data for selected items or groups of items.

Current survey reporting requirements divide survey items into two groups: mandatory and voluntary. Response to four data items on the questionnaires (total R&D expenditures, Federal R&D funds, net sales, and total employment) is mandatory, whereas response to the remaining items is voluntary. During the 1990 survey cycle, NSF conducted a test of the effect of reporting on a completely voluntary basis to determine if combining both mandatory and voluntary items on one questionnaire influences response rates. For this test, the 1990 sample was divided into two panels of approximately equal size. One panel, the mandatory panel, was asked to report as usual (four mandatory items and the remainder voluntary), and the other panel, the voluntary panel, was asked to report all items on a completely voluntary basis. The result of the test was a decrease in the overall survey response rate to 80 percent from levels of 88 percent in 1989 and 89 percent in 1988. The response rates for the mandatory and voluntary panels were 89 percent and 69 percent, respectively. Detailed results of the test were published in Research and Development in Industry: 1990.

Comparability of Statistics

Summarized in this section are the statistical revisions that have been made because of changes in survey procedures and practices.¹³ This section is divided into two parts. The first focuses on the current-year survey with a discussion of recent survey improvements and the effects these have had on current-year and immediate prior-year statistics. The second part describes revisions made to statistics produced from pre-1992 surveys.

Current-Year Considerations Recent Survey Improvements¹⁴

Before the 1992 survey, the sample of firms surveyed was selected at irregular intervals.¹⁵ In

¹² See the NSF technical report cited above for an explanation of the uncertainties in the data and to quantify their sensitivity to the choice of various possible imputation procedures.

¹³ See also the technical paper U.S. Department of Commerce, Bureau of the Census, *Documentation of the Survey Design for the Survey of Industrial Research and Development:* A Historical Perspective (Washington, DC, 1995)

¹⁴ See also National Science Foundation, SRS Data Brief, "1992 R&D Spending by U.S. Firms Rises, NSF Survey Improved" (NSF 94-325), (Arlington, VA, Sept. 9, 1994).

¹⁵ During the early years of the survey, until 1967, samples were selected every 5 years. Subsequent samples were selected for 1967, 1971, 1976, 1981, and 1987.

Table B-4. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1988

| Page 1 of 2 | | Company | | \$11,507 | (D) (D) 37 163 2,952 1,064 1,286 602 | 705 51 332 157 70 87 | 90 1,694 1,399 295 | 1,927 (D) 580 (D) (D) 135 | 1,280 404 96 780 | 524 56 469 | 46 1,212 |
|-------------|---------|--------------------------|-----------------------|----------|---|--|----------------------------------|--|---------------------------------|---|--|
| | Applied | Federal | | \$3,255 | 0 | 000000 | <u> </u> | 495 0 (D) (D) | 1,432 (D) (D) 1,330 | <u> </u> | 0 |
| | | Total | | \$14,762 | (D) 3,079 (D) (D) (D) (D) | 000000 | <u> </u> | 2,422 (D) (D) 1,315 135 | 2,712 (D) (D) 2,111 | <u> </u> | 46 1,909 |
| | | Company | | \$2,315 | (C) | 22 128 66 66 84 | 31 193 143 (S) | 7. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. | 151 71 (S) 75 | 219 40 | 380 |
| | Basic | Federal | millions] | \$731 | 00004400 | <u> </u> | 000 | 17 0 0 0 0 0 | 182 0 0 182 | <u>(a)</u> (a) | 208 |
| | | Total | [Dollars in millions] | \$3,046 | (D) (D) 35 569 224 (S) (S) | (D) 222 128 66 66 | £ (D) (D) (S) | 80000 | 334 71 (S) 258 | (D) 40 (D) (D) | (S) 888 |
| | | Company | | \$66,672 | 1,173 215 165 752 10,828 3,939 4,900 1,989 | 1,975 718 697 620 252 368 | 718 11,929 9,347 2,582 | 9,975 149 4,798 3,684 1,345 | 13,910 7,783 361 5,766 | 5,339 1,863 3,476 | 7,257 |
| | Total | Federal | | \$30,343 | 0 | 25 (D) (D) 14 14 (D) (D) 14 (D) 14 (D) 15 (D) 15 (D) 16 (D | 163 (D) (D) | 4,153 0 3,630 449 74 | 20,865 (D) (D) 18,402 | \$191 (S) | (D) 3,256 |
| | | Total | | \$97,015 | (D) (D) (11,067 4,172 4,906 1,989 | 1,997 (D) (D) (37 253 384 | 881 (D) 2,682 | 14,128 8,427 4,133 1,419 | 34,775 (D) (D) 24,168 | 5,530 1,959 3,571 | (D) 10,513 |
| | | SIC code | | | 20,21 22,23 24,25 26,25 26 28 281-82,286 283 284-85,287-89 | 13,29 30 32 32 33 33-32,3398-99 333-36 | 34 35 357 351-56,358-59 | 36 365 366 367 361-64,369 | 37 373-75,379 372,376 | 38 381-82 383-87 | 27.31.39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 |
| | | Distribution by industry | | Total | Food, kindred, and tobacco products Textiles and apparel Lumber, wood products, and furniture Paper and allied products Chemicals and allied products Industrial chemicals. Drugs and medicines | Petroleum refining and extraction | Fabricated metal products | Electrical equipment | Transportation equipment | Professional and scientific instruments | Other manufacturing industries |

See explanatory information and SOURCE at end of table.

Table B-4. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1988

| Page 2 of 2 | ıres | Company | | 29.7 | (D) 47.7 30.6 39.6 29.8 29.7 36.1 | 30.5 84.8 8.3 44.0 10.6 | 47.5 17.2 11.9 36.4 | 25.2 90.6 14.1 30.0 44.6 | 28.3 30.6 48.6 23.8 | 56.0 80.2 43.1 | 36.7 |
|-------------|--|---------|-----------------------|----------|--|---|----------------------------------|---------------------------------------|------------------------------------|---|--|
| | Percent of expenditures not distributed | Federal | | 24.9 | (D) (O) (O) (D) (O) (O) (O) (O) (O) (O) (O) (O) (O) (O | 4.60 0.00 4.60 0.00 | 33.8 (D) 0.0 72.4 | 21.8 0.0 20.2 29.9 52.4 | 26.6 (D) (D) 25.0 | 14.8 20.8 9.4 | (D) 27.8 |
| | Perce | Total | | 28.2 | (C) (D) (D) (D) (D) (D) (D) (D) (D) (D) (D | 30.7 (D) 23.8 43.8 10.6 | 45.0 (D) (D) 37.8 | 24.2 90.6 16.7 30.0 45.0 | 27.3 (D) (D) 24.7 | 54.6 77.3 42.2 | (D) 34.0 |
| | | Company | | \$19,789 | 268 103 50 298 3,227 1,171 1,770 | 602 466 58 58 150 111 39 | 341 2,057 1,117 940 | 2,516 135 677 1,105 600 | 3,930 2,384 175 1,371 | 2,992 1,494 1,498 | 2,666 |
| | Expenditures not distributed | Federal | | \$7,529 | 00000000 | 100000 | 55 73 0 73 | 907 0 734 134 39 | 5,554 826 136 4,593 | 28 20 6 | (D) 904 |
| | . . | Total | [suc | \$27,317 | 268 (D) 50 298 3,230 1,172 1,772 | 613 466 58 152 1111 | 397 2,130 1,117 1,013 | 3,422 135 1,410 1,239 639 | 9,485 3,210 311 5,964 | 3,020 1,514 1,507 | (D) 3,570 |
| | 0.70 | Company | [Dollars in millions] | \$33,061 | 549 92 60 256 4,094 1,494 1,528 | 614 179 179 248 70 179 | 256 7,985 6,688 1,297 | 5,158 (D) (D) 1,285 515 | 8,548 (D) (D) 3,540 | 1,603 | 2,998 |
| | Development | Federal | | \$18,829 | <u> </u> | °6°666 | 6666 | 2,734 0 (D) (D) 35 | 13,697 (D) (D) 12,297 | (D) (D) | 1,148 |
| | | Total | | \$51,890 | (E) | 65 (0) (0) (0) (0) (0) | 0000 | 7,893 (D) 5,845 (D) 550 | 22,244 (D) (D) 15,836 | 1,725 (D) | 241 |
| - | SIC code | | | | 20,21 22,23 24,25 26 28 281-82,286 283 284-85,287-89 | 13,29 30 32 33 33 33-36 | 34 35 357 351-56,358-59 | 36 365 365 367 367 | 37 371 373-75,379 372,376 | 38 381-82 383-87 | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 |
| | Distribution by industry | | | Total | Food, kindred, and tobacco products. Textiles and apparel. Lumber, wood products, and furniture. Paper and allied products. Industrial chemicals Drugs and medicines. Other chemicals. | Petroleum refining and extraction Rubber products Stone, clay, and glass products Primary metals Ferrous metals and products Nonferrous metals and products | Fabricated metal products | Electrical equipment | Transportation equipment | Professional and scientific instruments | Other manufacturing industries |

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

Table B-5. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1989

| | open dia | | Total | | | Basic | | | Applied | 000000000000000000000000000000000000000 |
|---|--|---|-----------------------------------|--|--|---|--|---|--|---|
| Usinguiton by industry | 2000 | Total | Federal | Company | Total | Federal | Company | Total | Federal | Company |
| | | | | | [Dolla | [Dollars in millions] | | | | |
| Total | | \$102,055 | \$28,554 | \$73,501 | \$3,791 | \$1,050 | \$2,741 | \$16,895 | \$3,567 | \$13,328 |
| Food, kindred, and tobacco products | 20,21 22,23 24,25 26 26 28 281-82,286 283 284-85,287-89 | (D) 192 879 12,069 4,451 (D) | <u>0</u> 00°24500 | 1,24 223 192 192 11,943 4,340 5,512 2,091 | (S) (C) (S) (S) (S) (S) (S) (S) (S) (S) (S) (S | 00002500 | (3) (3) (3) (4) (5) (6) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7 | 3,455 3,602 3,602 3,602 3,602 3,602 | <u> </u> | 354 13 (D) 153 3,588 1,166 1,730 692 |
| Petroleum refining and extraction | 13,29 30 32 33 33 331-32,3398-99 | 2,180 (D) (B88 (D) (D) | <u> </u> | 2,162 867 615 666 244 422 | 0,000 | <u>(a)</u> (a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c | 76 21 125 70 (0) | 000000 | 000000 | 708 57 264 165 (D) |
| Fabricated metal products | 34 35 357 351-56,358-59 | 904 14,497 (D) (D) | 178 1,155 (D) | 726 13,342 10,725 2,618 | 8(D) 8 | ° (j) (j) ° | 26 (S) (S) (S) (S) | <u> </u> | 9999 | 95 2,355 2,027 328 |
| Electrical equipment. Radio and TV receiving equipment. Communication equipment. Electronic components. | 365 365 366 367 367 | 13,318 96 7,071 4,025 2,127 | 3,743 0 2,911 369 463 | 9,575 96 4,159 3,655 1,664 | 00000 | 0°400 | 378 (D) (D) 56 56 (D) | \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$ | (a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c | 1,878 (D) (D) 1,190 259 |
| Transportation equipment | 37 373-75,379 372,376 | 33,859 (D) (D) 22,331 | 19,262 (D) (D) 16,828 | 14,596 8,756 337 5,503 | 498 56 3 439 | 347 0 347 | 150 56 (S) 92 | 2,771 (D) 2,072 | (D) (D) 1,326 | (D) (D) 446 |
| Professional and scientific instruments | 381-82 383-87 | 5,992 2,366 3,626 | \$263 162 101 | 5,729 2,205 3,525 | <u>(28)</u> | (a) (a) | 205 (S) 174 | (D) (D) | 97 (a) | 506 21 486 |
| Other manufacturing industries | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 | (D) 14,031 | 3,729 | 10,302 | (S) 1,282 | 0 999 | (S) 618 | 2,641 | 896 | 1,745 |

See explanatory information and SOURCE at end of table.

Table B-5. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1989

| SS | Company | | 27.0 | 19.2 5.2.6 3.2.6 40.5 24.4 30.7 13.4 | 31.1 64.1 7.8 22.7 44.1 10.3 | 50.6 14.8 11.4 28.7 | 22.2 84.5 13.6 27.0 29.6 | 25.1 30.6 50.3 14.7 | 56.8 81.5 41.3 | 31.8 |
|--|---------|-----------------------|----------|--|---|----------------------------------|---------------------------------------|------------------------------------|---|--|
| Percent of expenditures not distributed | Federal | | 27.0 | 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 | # <u>0</u> 07,00 | (C) 4, (C) (C) | 28.5 0.0 22.1 30.1 67.6 | 28.5 (D) (D) 26.8 | 33.4 50.0 | (D) 22.6 |
| Percer | Total | | 27.0 | (D) 32.6 40.5 40.5 (D) | 31.5 | (D) 44.2 (D) (D) | 24.0 84.5 17.1 27.3 37.8 | 27.0 (D) (D) 23.8 | 55.8 79.4 | (D) 29.3 |
| | Company | | \$19,833 | 238 117 63 356 2,913 1,331 1,302 280 | 671 556 48 151 108 | 367 1,973 1,223 | 2,126 81 566 987 492 | 3,660 2,683 169 807 | 3,253 1,798 1 456 | 3,271 |
| Expenditures not distributed | Federal | | \$7,713 | 0 0 0 7 7 4 0 0 | <u>4</u> 0000 | (D) 86 98 86 86 | 1,067 0 643 111 | 5,483 910 65 4,508 | 88 81 | (D) 843 |
| | Total | llions] | \$27,545 | 238 117 63 356 2,960 1,378 1,302 280 | 688 556 50 172 109 | (D) 2,059 1,223 836 | 3,193 81 1,210 1,098 805 | 9,143 3,593 234 5,316 | 3,341 | (D) 4,115 |
| | Company | [Dollars in millions] | \$37,599 | 589 (D) 63 333 4,753 1,598 2,084 1,070 | 707 233 178 279 207 | 238 (S) (S) (S) | 5,193 (D) 3,007 1,422 (D) | (D) 3,858 | 1,764 | 277 4,668 |
| Development | Federal | | \$16,224 | <u>6</u> 60°% | ~ <u>@</u> @@@@ | 0000 | 2,029 0 1,707 (D) (D) | (D) (D) 10,646 | 71 0 | 1,326 |
| | Total | | \$53,823 | (D) 4, 803 33 33 (C) (D) (C) (D) (D) (D) (D) (D) (D) (D) (D) (D) (D | 000000 | (D) (D) (D) (D) (D) | 7,222 (D) 4,714 (D) 905 | 21,448 (D) (D) 14,504 | 1,835 | 277 5,994 |
| SIC code | | | | 20,21 22,23 24,25 26,25 28 281-82,286 283 284-85,286 | 13,29 30 32 33 33 331-32,3398-99 333-36 | 34 35 357 351-56,358-59 | 36 365 366 367 361-64,369 | 37 371 373-75,379 372,376 | 38 381-82 383-87 | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 78-79, 80-81, 83-84, 87, 89, |
| Distribution by industry | | | Total | Food, kindred, and tobacco products Textiles and apparel Lumber, wood products, and furniture Paper and allied products Chemicals and allied products Industrial chemicals Drugs and medicines | Petroleum refining and extraction | Fabricated metal products | Electrical equipment | Transportation equipment | Professional and scientific instruments | Other manufacturing industries |

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table B-6. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1990

| | SIC code | | lotal | | | Basic | | | Applied | |
|---|--|--|---|---|------------------------------|--|---|--|---------------------------|--|
| | | Total | Federal | Company | Total | Federal | Company | Total | Federal | Company |
| | | | | | <u>ā</u> | [Dollars in millions] | | | | |
| Total | | \$109,727 | \$28,125 | \$81,602 | \$4,500 | \$981 | \$3,519 | \$18,551 | \$3,684 | \$14,867 |
| Food, kindred, and tobacco products | 20,21 22,23 24,25 26 28 281-82,286 | (D) 216 1,059 13,291 5,010 | (D) | 1,248 260 216 1,059 13,168 4,902 | £00000 £00000 | 0000gg | \$2 (9 (9 (9 (9 (9 (9 (9 (9 (9 (9 (9 (9 (9 | 336 20 20 (D) 4,074 (D) | 00008 | 336 20 20 (D) 4,051 4,661 |
| Drugs and medicinesOther chemicals | 283 284-85,287-89 | <u> </u> | <u> </u> | 5,917 | <u>(8</u> (8) | 00 | (S) (S) | <u>0</u> 00 | <u>0</u> 00 | 1,917 (S) |
| Petroleum refining and extraction Rubber products Stone, clay, and glass products Primary metals Ferrous metals and products Nonferrous metals and products | 13,29 30 32 33 33 331-32,3398-99 333-36 | 2,306 (D) (D) (D) | Ø00000 | 2,289 1,056 538 717 231 486 | 0,40000 | (a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c | 85 123 (©) | ¥ 00000 | ° <u>6666</u> | 748 77 274 (S) 63 (S) |
| Fabricated metal products | 34 35 357 351-56,358-59 | 939 14,473 (D) (D) | 203 898 (D) | 736 13,575 10,988 2,587 | % <u>0</u> <u>0</u> <u>0</u> | \$ <u>(0</u> (0)(0) | 25 130 (D) | £ 6 6 6 | <u> </u> | (0,00,00) (0,00,00) (0,00,00) |
| Electrical equipment | 36 365 366 387 361-64,389 | 13,400 1,414 5,928 3,914 3,444 | 4,133 0 2,344 418 1,371 | 9,267 114 3,584 3,496 2,074 | 376 (D) (D) (D) | 60 0 0 0 0 0 | 303 (D) (D) 58 58 | 2,631 (D) (D) (D) 470 | 612 0 0 0 0 | 2,019 (D) (D) 981 470 |
| Transportation equipment | 37 373-75,379 372,376 | 31,361 (D) (D) 20,635 | 17,097 (D) (D) 15,248 | 14,264 8,594 283 5,387 | 489 73 3 413 | 326 12 313 | 163 61 3 100 | (D) 651 (D) 2,174 | (D) (D) 10 1,648 | 1,105 (D) (D) 527 |
| Professional and scientific instruments | 381-82 | 7,055 | \$737 (S) | 6,318 | <u> </u> | <u> </u> | 194 25 | 705 (D) | (0 2 | 101 |
| Other manufacturing industries | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, | 20,793 | (D) 4,442 | 541 16,351 | (C) 60 1,908 | 553 | 1355 | 3,688 | (C) 0 1,068 | 78 78 2,620 |

See explanatory information and SOURCE at end of table.

Table B-6. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1990

| | | | | | | | | | | Page 2 of 2 |
|---|---|--|---|--|---|--|---|---|--|--|
| Distribution by industry | SIC code | | Development | | - | Expenditures not distributed | | Perc | Percent of expenditures not distributed | S |
| | | Total | Federal | Company | Total | Federal | Company | Total | Federal | Company |
| | | | | [Dollars in millions] | nillions] | | | | | |
| Total | | \$56,105 | \$17,495 | \$38,610 | \$30,570 | \$5,965 | \$24,606 | 27.9 | 21.2 | 30.2 |
| Food, kindred, and tobacco products | 20,21 22,23 24,25 26,25 28 281-82,286 283 284-85,287-89 | 573 88 77 74 434 5,273 (D) (D) | 0 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 573 (D) 77 434 5,246 1,731 2,174 | (D) 145 65 426 3,232 1,516 1,516 1,457 | (D) 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 214 135 65 426 3,164 1,459 1,446 259 | (0) 30.1 30.1 30.3 30.3 30.3 (0) (0) | 90.9 90.9 0.0 55.4 (D) | 17.1 52.1 30.1 40.3 24.0 29.8 24.4 11.0 |
| Petroleum refining and extraction | 13,29 30 32 33 331-32,3398-99 333-36 | (D) (D) (D) (D) (D) (D) (D) (D) (D) (D) | 000000 | 806 252 155 (D) | 645 687 48 178 109 69 | 008477 | 640 687 51 174 107 68 | 27.9 | 27.3 (D) (D) (D) (D) | 28.0 65.1 9.5 24.3 46.3 14.1 |
| Fabricated metal products | 34 35 357 351-56,358-59 | 33 | 0000 | (D) 9,168 7,736 1,431 | 451 1,993 1,154 840 | 116 0 0 42 | 332 1,877 1,081 798 | 48.1 13.8 (D) | 58.6 12.9 0.0 (D) | 45.2 13.8 9.8 30.8 |
| Electrical equipment. Radio and TV receiving equipment. Communication equipment | 365 365 366 367 367 361-64,369 | 6,914 13 3,831 1,478 1,592 | 2,891 0 1,721 197 973 | 4,024 13 2,110 1,281 619 | 3,479 94 927 1,237 | 557 0 98 62 62 398 | 2,922 94 830 1,175 823 | 26.0 82.8 15.6 31.6 35.4 | 13.5 0.0 4.2 14.8 29.0 | 31.5 82.8 23.1 33.6 39.7 |
| Transportation equipment | 37 371 373-75,379 372,376 | (D) (D) (D) 13,411 | 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 | 8,456 (D) (D) 3,247 | 8,320 3,428 255 4,637 | 3,781 568 89 3,124 | 4,539 2,861 166 1,513 | 26.5 (D) 22.5 | 22.1 (D) 20.5 | 31.8 33.3 58.6 28.1 |
| Professional and scientific instruments | 381-82 383-87 | (D) 200 (D) 200 | (D) (D) | 1,995 497 1,498 | 4,121 2,719 1,521 | 687 647 39 | 3,434 2,073 1,481 | 58.4 81.3 41.0 | 93.2 99.5 45.3 | 54.4 76.9 40.9 |
| Other manufacturing industries | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 83-84, 87, 89 | 337 9,054 | 2,622 | 6,432 | (D) 6,143 | (D) 199 | 66 5,944 | (D) 29.5 | 100.0 | 36.4 |

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table B-7. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1991

| | | ing for | on y and so | by midden y and source of fulles. | | | | | | Page 1 of 2 |
|--|--|--|---------------------------------|---|---|------------------------|--|--|--|--|
| | | | Total | | | Basic | | | Applied | |
| Distribution by industry | SIC code | Total | Federal | Company | Total | Federal | Company | Total | Federal | Company |
| | 1 | | | | <u>C</u> | [Dollars in millions] | | | | |
| Total | | \$116,952 | \$26,372 | \$90,580 | \$8,584 | \$2,767 | \$5,817 | \$22,838 | \$4,595 | \$18,243 |
| Food, kindred, and tobacco products. Textiles and apparel Lumber, wood products, and furniture Paper and allied products Industrial chemicals Drugs and medicines Other chemicals | 20,21 22,23 24,25 26,25 28 281-82,286 283 284-85,286 | 1,277 (D) (D) 14,648 5,390 (D) (D) | 0000000000 | 1,277 236 201 1,174 14,439 5,525 6,947 2,267 | 2 2 <u>9</u> 2 3 8 <u>9</u> 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 | °°6°8666 | 98 21 17 1,362 508 732 732 | (0) 4,022 (0) (0) (0) (19 | °6°6066°°°°°°°°°°°°°°°°°°°°°°°°°°°°°°° | 417 29 61 386 3,940 1,110 2,114 716 |
| Petroleum refining and extraction. Rubber products | 13.29 30 32 33 33 33-32,3398-99 | 2,4 (C) 7,7 (C) 7,7 (C) 1,4 (C) 1,4 (C | £00°00 | 2,487 (D) 455 706 225 481 | 000000 | <u> </u> | 0.0 8.0 0.0 8.0 0.0 0.0 | 0 <u>%</u> 0000 | 6°6666 | 725 237 154 164 280 (D) (S) |
| Fabricated metal products | 34 35 357 357-56,358-59 | 974 14,775 (D) (D) | 226 1,055 (D) (D) | 748 13,720 10,419 3,301 | 4000 | ° @ @ @ | 44 315 176 139 | (D) | 000% | 130 1,752 1,055 697 |
| Electrical equipment | 365 365 366 367 361-64,369 | 13,415 102 (D) 3,465 (D) | 4,550 0 (D) 288 (D) | 8,865 102 (S) 3,177 2,403 | ê° ê ê ê | ê°êêê | 221 8 37 106 70 | (D) 8 (D) 754 (D) | <u>6°606</u> | 2,002 8 549 710 735 |
| Transportation equipment | 37 371 373-75,379 372,376 | 27,428 (D) (D) 16,983 | 12,570 (D) (D) 11,450 | 14,858 9,063 262 5,533 | 503 (D) 10 10 10 | 33(D) 330 33(D) 330 | 173 (D) 80 | 2,288 (D) (D) 1,354 | 935 (D) 527 | 1,353 (D) (D) 827 |
| Professional and scientific instruments | 38 381-82 383-87 | 8,705 (D) | 1,865 (D) | 6,840 3,017 3,823 | 389 (D) | <u> </u> | (D) 243 | 2,027 (D) | <u> </u> | (D) |
| Other manufacturing industries | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 | (D) 28,446 | (D) 5,505 | (D) 22,941 | (D) 5,000 | (D) 2,383 | 2,617 | (D) 6,328 | 1,272 | (D) 5,056 |

See explanatory information and SOURCE at end of table.

Table B-7. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1991

| \$1C code Total \$65,434 \$65,434 \$65,434 \$66,434 \$22,23 \$133 \$22,23 \$133 \$24,25 \$6,617 \$284-85,287-89 \$6,617 \$30 \$13,29 \$957 \$13,29 \$957 \$13,29 \$13,29 \$10,00 | 5,434 | | _ | | not distributed | | | not distributed | o D |
|--|---|--|--|---------------------------------|------------------------------|---|----------------------------|----------------------------|--|
| \$65, 20,21 22,23 24,25 28,28 28 28 283 284-85,287-89 13,29 30 31 33 331-32,3398-99 33 33 34 | \$65,434 | Federal Con | Company | Total | Federal | Company | Total | Federal | Company |
| 20,21 22,23 24,25 24,25 28,286 2,283 284-85,287-89 13,29 33 331-32,3398-99 33-36 35-36 | \$65,434 | | [Dollars in millions] | [suc | | | | | |
| 20,21 22,23 24,25 26,25 28 281-82,286 2,83 283 283 283 283 33 33 33 33 33 33 33 33 33 33 33 33 3 | _ | \$13,961 | \$51,473 | \$20,096 | \$5,049 | \$15,047 | 17.2 | 19.1 | 16.6 |
| 13,29 30 32 33 33 33-36 33-36 | 600 133 4 28 6,617 2,673 (D) | (D) 28 8 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 600 128 88 428 6,554 2,614 1,252 | 600020000 | °66°666 | 162 58 35 221 2,583 993 1,413 | | 80000000 | 12.7 24.6 17.4 18.8 17.9 17.9 10.0 20.3 |
| 35 | 2 600000 | °00000 | 952 407 229 297 (S) | <u> </u> | 0004000 | (D) 75 75 75 75 75 | <u> </u> | 000000 | (D) (D) 5.3 8.1 8.1 9.6 |
| 351-56,358-59 2 | (D) (D) (D) 2,225 | 6665 | 449 9,216 7,101 2,115 | 6668 | <u> </u> | 125 2,437 2,087 350 | <u> </u> | <u> </u> | 16.7 17.8 20.0 10.6 |
| Electrical equipment 36 7,258 Radio and TV receiving equipment 365 82 Communication equipment 366 (D) Electronic components 367 (D) Other electrical equipment (D) | 7,258 82 (D) (D) (D) | 2,665 0 (0) (0) | 4,593 82 1,401 2,036 1,074 | 2,571 4 (D) (D) (D) | 0000 0000 | 2,049 4 1,196 325 524 | 19.2 3.9 (0) | tt 6.0000 | 23.1 3.9 (S) 10.2 21.8 |
| Transportation equipment. 37 17,324 Motor vehicles and motor vehicles equipment. 373-75,379 (D) Other transportation equipment. 373-75,379 (D) Aircraft and missiles. 10,545 | 17,324 (D) (D) 10,545 | <u> </u> | 10,086 (D) (D) 4,012 | 7,313 (D) (D) 4,674 | 4,067 (D) (D) 4,060 | 3,246 (D) (D) 614 | 26.7 (D) (D) 27.5 | 32.4 (D) (D) 35.5 | 21.8 (D) (D) 11.1 |
| Professional and scientific instruments | 4,508 | 1,160 | 3,348 | (D) | (D) | 1,458 | (D) | Q) | 0 |
| Scientific and mechanical measuring instruments 381-82 (D) Optical, surgical, photographic, and other instruments | (Q) (Q) | <u> </u> | 1,282 | <u> </u> | 0 0 | 624 | (a) | <u>(</u>) (<u>0</u>) | 20.7 |
| Other manufacturing industries | 15,620 | 1,849 | 327 13,771 | (D) 1,498 | (D) | 40 1,497 | (D) 5.3 | (D) 0.0 | (D) 6.5 |

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

Table B-8. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1992

| | | | Total | | | Basic | | | Applied | |
|---|--|--|-----------------------------------|---|---|-----------------------|---|--|--------------------------|--|
| Distribution by industry | SIC code | Total | Federal | Company | Total | Federal | Company | Total | Federal | Company |
| | | | | | [Dollars | [Dollars in millions] | | | | |
| Total | | \$121,314 | \$24,660 | \$96,654 | \$8,443 | \$2,584 | \$5,859 | \$22,791 | \$4,194 | \$18,597 |
| Food, kindred, and tobacco products | 20,21 22,23 24,25 26 28 281-82,286 284-85,287-89 | 1,411 277 (D) (B) 16,711 5,406 2,474 | <u>ୃଷ୍ଟିପ୍ରଷ୍ଟି</u> | 1,411 259 (D) 1,191 16,420 5,152 8,822 2,447 | 6 (0) (0) (0) (0) (0) (0) (0) (0) (0) (0) | 0 0 0 0 0 0 0 0 | 108 (D) (D) 1,618 534 925 159 | 4,42 (0) (0) (0) (0) (0) (0) | °6°6°66 | 430 28 59 441 4,404 1,098 2,510 796 |
| Petroleum refining and extraction | 13,29 30 32 33 33 331-32,3398-99 333-36 | 2,339 (D) 555 (D) | ° <u>6 6 9 6 6</u> | 2,330 1,337 479 542 524 318 | 609992 | <u>6°69</u> 6° | 180 (S) 30 30 29 | 795 161 (D) 98 125 | °°66°° | 795 161 168 216 98 |
| Fabricated metal products | 34 35 357 351-56,358-59 | 1,057 15,135 (D) (D) | 293, 1,062 (D) | 764 14,073 10,650 3,423 | <u> </u> | <u> </u> | 47 609 457 152 | 9998 | 6662 | 131 1,516 749 767 |
| Electrical equipment | 365 365 366 367 367 | 13,546 (D) 3,678 (D) | 3,857 (D) (D) 250 (D) | 9,689 93 3,435 3,428 2,733 | 00000 | 6°666 | 286 (D) 50 14 14 | 00000 | 00000 | 2,141 (D) 478 (D) 883 |
| Transportation equipment | 37 373-75,379 372,376 | 26,484 (D) (D) 16,119 | 10,758 (D) (D) 9,871 | 15,726 (D) (D) 6,248 | 444 63 21 360 | 306 | 138 63 21 54 | 1,948 (D) (D) 1,439 | 797 (D) (D) 754 | 1,151 (D) (D) 685 |
| Professional and scientific instruments | 381-82 | 9,652 5,256 4,396 | 2,226 2,148 78 | 7,426 3,108 4,318 | 415 (D) | 6 (a) | 407 137 270 | 2,111 (D) | (D) (Q) | 1,745 1,008 737 |
| Other manufacturing industries | 27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 | (D) 30,103 | 5,892 | (D) 24,211 | (D) 4,237 | (D) 2,226 | 2,011 | (D) 6,551 | (D) 1,429 | 5,122 |

See explanatory information and SOURCE at end of table.

Table B-8. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source funds: 1992

| | | Development | | Ш | Expenditures not distributed | | Perc | Percent of expenditures not distributed | se. |
|---|--|-----------------------------------|--|--|---|---|-----------------------------|--|---|
| SIC code | Total | Federal | Company | Total | Federal | Company | Total | Federal | Company |
| | | | [Dollars in millions] | lsuc] | | | | | |
| | \$69,504 | \$13,683 | \$55,821 | \$20,576 | \$4,199 | \$16,377 | 17.0 | 17.0 | 17.0 |
| 20,21 22,23 24,25 26,25 28 28 281-82,286 283 284-85,287-89 | 706 (1.25 (D) (2.26 (D) (2.26 (D) (2.28 7.248 2.742 (2.38 2.38 (D) (2.38 (D) | 0 4 ① 0 4 4 ① ① | 706 138 (D) 7,206 2,701 3,190 | 167 3,428 (0) (0) (0) | (D) | 167 69 33 2113 3,193 2,197 | #.0000% 6.0000 | ° <u>6</u> 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 | 11.8 26.6 0.0 17.7 15.9 4.9 24.9 7.2 |
| 13,29 30 32 33 33-32,3398-99 333-36 | | <u> </u> | 785 578 250 247 102 145 | (a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c | <u> </u> | 570 473 21 29 (D) | 666666 | | 24.5 35.4 4.4 9.0 (D) |
| 34 35 357 351-56,358-59 | 34 681 35 10,017 357 (D) | 228 588 (0) | 454 9,429 7,193 2,236 | 2,548 (D) (D) | 0,2,0,0 | 132 2,519 (D) (D) | (5) 16.8 (5) (5) | (9) (3) (9) | 17.3 17.9 (D) (D) |
| 36 365 366 367 367-64,369 | 365 7,569 365 (D) 366 (D) 367 2,421 369 (D) | 2,305 (D) (D) 163 (D) | 5,263 72 1,719 2,257 1,215 | 2,52 | 524 | 1,999 (D) (D) 521 | | | 20.6 (0) (19.7) |
| 37 371 3-75,379 372,376 | 373-75,379 (D) (A) 372,376 (D) | 6,930 (C) (C) (C) (D) | 11,006 (D) (D) 5,082 | 6,156 (D) 3,143 | 2,725 (D) (D) 2,716 | 3,431 (D) (D) 427 | 23.2 (D) (D) 19.5 | 25.3 (D) (D) 27.5 | 21.8 (D) (D) 6.8 |
| 38 381-82 | 38 5,161 82 (D) | 1,430 (D) | 3,731 1,360 | 1,965 (D) | 420 (D) | 1,543 603 | 20.4 (D) | 18.9 (D) | 20.8 |
| 383-87 | (D) 28 | (a) | 2,371 | Q) | (a) | 940 | (a) | <u>(a)</u> | 21.8 |
| 27,31,39 07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89 | (D) 17, 17,187 17,187 17,187 19, 17,187 19, 17,187 17,187 18,189 | (D) 2,038 | 380 15,149 | 2,128 | 199 | 38 1,929 | (0) | 3.0 | (D) 8.0 |

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

Table B-9. Unit response rates--Number of companies responding to survey, by industry: 1992

Page 1 of 1 Number of Response Industry SIC code companies rate receiving form [Percent] Total..... 23,166 84.0 Distribution by industry Food, kindred, and tobacco products 20,21 381 82.9 Textiles and apparel..... 22,23 651 80.0 Lumber, wood products, and furniture..... 24,25 1,759 81.0 Paper and allied products..... 26 224 87.5 Chemicals and allied products..... 28 565 85.5 Industrial chemicals..... 281-82,286 103 84.4 Drugs and medicines..... 283 100 84.0 284-85,287-89 Other chemicals..... 362 86.2 Petroleum refining and extraction..... 13,29 925 83.0 Rubber products... 30 263 84.4 Stone, clay, and glass products..... 32 409 82.9 Primary metals... 33 596 85.1 Ferrous metals and products..... 331-32,3398-99 328 87.8 Nonferrous metals and products..... 333-36 81.7 Fabricated metal products..... 656 83.1 35 1,731 85.2 Office, computing, and accounting machines..... 357 167 77.2 Other machinery, except electrical..... 351-56,358-59 1,564 86.0 Electrical equipment..... 36 1,463 82.0 Radio and TV receiving equipment..... 365 81.5 Communication equipment..... 366 323 81.4 Electronic components..... 634 81.9 Other electrical equipment..... 361-64,369 452 82.5 Transportation equipment..... 37 298 87.2 Motor vehicles and motor vehicles equipment..... 371 93 84.9 Other transportation equipment..... 373-75,379 92.9 Aircraft and missiles..... 372,376 107 84.1 Professional and scientific instruments..... 38 824 82.3 Scientific and mechanical measuring instruments...... 381-82 388 84.8 Optical, surgical, photographic, and other 384-87 436 80.0 Other manufacturing industries 27,31,39 1,018 82.9 Nonmanufacturing industries..... 07-10, 12-17, 11,405 84.9 40-42, 44-49, 50-59, 60-65, 67 701, 73, 75-76, 78-79, 80-81 83-84, 87, 89

Table B-10. Item response rates--Percent of companies responding to selected items: 1992

Page 1 of 1 Percent Data Item 93.8 Sales 95.4 Total Employment Scientists and 76.7 Engineers 90.5 Federal R&D 1/ Company R&D 95.6 Total R&D

NOTE: These data represent response rates for specific items for companies with known R&D expenditures. Companies without R&D expenditures or with unknown R&D expenditures are not included in these figures.

^{1/} Item response for "Federal R&D" and for "Company R&D" are considered together; companies that report "Total R&D" and either of these expenditures implicitly report both company and Federal R&D, since these two items sum to total R&D.

intervening years a panel of the largest firms known to perform R&D was surveyed. For example, a sample of about 14,000 firms was selected for the 1987 survey. For the 1988 through 1991 studies, about 1,700 of these firms were annually resurveyed: the other firms did not receive another questionnaire. and their R&D data were estimated. This sample design was adequate during the early years of the survey because the performance of R&D remained concentrated in the manufacturing industries. However, as more and more firms began entering the R&D performing arena, the old sample design proved increasingly deficient because it did not capture births of new R&D performing firms; the entry of fledgling R&D performers into the marketplace simply was missed during panel years. Additionally, beginning in the early 1970s, the need for more detailed R&D information for nonmanufacturers was recognized. At that time, statistics for the broad industry classifications "miscellaneous business services" and "miscellaneous services" were added to the list of industry groups for which statistics were published. By 1975 about 3 percent of total R&D was performed by firms in nonmanufacturing industries.

During the mid-1980s there was evidence that an increasing number of nonmanufacturing firms were conducting a significant amount of R&D, and again the number of industries used to develop the statistics for nonmanufacturers was increased. Consequently, the annual reports in this series for 1987 and since have included separate R&D estimates for firms in the communication, utility, engineering, architectural, research, development, testing, computer programming, and data processing service industries; hospitals; and medical labs. Approximately 9 percent of the estimated industrial R&D performance during 1987 was undertaken by nonmanufacturing firms.

In addition to adding to the list of industries for which statistics were published, it became clear from these observations that the sample design itself should be changed to reflect the widening population of R&D performers among firms in the nonmanufacturing industries and small firms in all industries, to account better for births of R&D performing firms and to produce statistics that are generally more reliable. So, beginning with the 1992 survey, NSF decided to (1) draw new samples with broader coverage annually and (2) increase the sample size to approximately

23,000 firms.¹⁶ As a result of the sample redesign, for 1992 the reported nonmanufacturing share was estimated to be 25 percent of total R&D.¹⁷

Revisions to Immediate Prior-Year Statistics

As has been the practice throughout the history of the survey, results from the current-year survey are used not only to develop current-year statistics, but also to revise immediate prior-year statistics. Differences between originally developed statistics and revised statistics occur for three reasons: industry shifts, data revisions, and, of particular importance in the discussion of the 1992 survey results, the effects of a new sample. Table B-11 quantifies these effects for each industry and industry grouping.

Industry shifts. The movement of a company from one industry into another can be caused by several factors: changes in a company's payroll composition, which is used to determine the industry classification code (see discussion above under "Frame Creation"), changes in the industry classification system itself, and changes in the way the industry classification code is assigned or revised during survey processing. These are described below.

Payroll composition. A company's payroll composition changes because of a number of events. Among them are (1) the growth or decline of product

¹⁶ Annual sampling also will remedy the cyclical deterioration of the statistics that results from changes in a company's payroll composition because of product line and corporate structural changes.

¹⁷ For the 1992 survey, 25 new nonmanufacturing industry and industry groups were added to the sample frame: agricultural services (SIC 07); fishing, hunting, and trapping (09); wholesale trade-nondurables (51); stationery and office supply stores (5112); industrial and personal service paper (5113); groceries and related products (514); chemicals and allied products (516); miscellaneous nondurable goods (519); home furniture, furnishings, and equipment stores (57); radio, TV, consumer electronics, and music stores (573); eating and drinking places (581); miscellaneous retail (59); nonstore retailers (596); real estate (65); holding and other investment offices (67); hotels, rooming houses, camps and other lodging places (70); automotive repair, services, and parking (75); miscellaneous repair services (76); amusement and recreation services (79); health services (80); offices and clinics of medical doctors (801); offices and clinics of other health practitioners (804); miscellaneous health and allied services not elsewhere classified (809); engineering, accounting, research, management, and related services (87); and management, and public relations services (874).

or service lines; (2) the merger of two or more companies; (3) the acquisition of one company by another; (4) divestitures; or (5) the formation of conglomerates. With annual sampling, when it is determined that a company's payroll composition—and therefore its industry classification—has changed, the company's data are reclassified into the new industry beginning in the year of the change. Prior to annual sampling, firms were not subject to annual reclassification. Most of the shifts in R&D performance between industries detailed in table B-11 undoubtedly stemmed from changes in companies' payroll composition.

Industry classification system. From time to time the standard industrial classification (SIC) coding system, which is used by most Federal Government agencies that publish industry statistics, is revised to reflect the changing composition of U.S. industry. For statistics developed for 1988-91 from the 1988-91 surveys, companies retained the industry classifications assigned for the 1987 sample. These classifications were based on the 1977 SIC system. The last major revision of the SIC system was for 1987, so this new system was used to classify companies in the 1992 survey. Consequently, the 1992 statistics and revised 1991 statistics in this report were developed using the 1987 SIC system and minor data shifts are attributable to the system change. For example, the 1987 system expanded SIC 30, rubber products, to include a variety of specific plastic products that may have been classified elsewhere using the 1977 system.

Processing changes. Finally, in response to perceived changes in the amount and dispersion of R&D among industries and findings of various quality improvement initiatives and other research undertakings, the sponsor of the survey, in consultation with the compiling agent, from time to time seeks to improve the coverage of the survey by revising the method used to classify firms. Research has shown that there is no impact on the aggregated statistics because of these processing changes and the impact on individual industry estimates is minor.¹⁸ The

current method used to classify firms is discussed above under "Frame Creation." Methods used for past surveys are discussed in the technical paper cited below.¹⁹

As table B-11 shows, in the aggregate, industry shifts had no effect on the revised 1991 estimate of total R&D. However, the effects are evident among the industry groupings. Most affected were statistics for the electrical equipment (SIC 36), transportation equipment (SIC 37), and nonmanufacturing industries. Approximately \$6.9 billion of R&D previously reported for manufacturing industries was shifted to nonmanufacturing industries in the revised 1991 statistics.

Data revisions. Changes to reported data can come from two sources: from respondents (see discussion above under "Survey Questionnaires") and from analysts involved in survey and statistical processing. Respondents from companies that were in both the 1991 and 1992 surveys may have revised previously reported data for 1991. Analysts, while performing followup, may have corrected incorrectly reported or supplied missing 1991 data. Data revisions accounted for \$1.0 billion or 6.8 percent of the \$14.7 billion revision to the 1991 estimate of total R&D.

Sample design. Changes to the sample design can dramatically affect revisions to immediate prioryear estimates. By far the most profound influence on the revisions to the 1991 statistics was the new sample design. It accounted for \$13.7 billion or 93.2 percent of the \$14.7 billion revision to total R&D with most of this amount (\$11.4 billion) attributable to the wider sampling of the nonmanufacturing industries.²⁰

To summarize, differences between originally published and revised 1991 statistics stem from industry shifts, data revisions, and the new sample. Of the three, the new sample had the largest effect

¹⁸ The effects of recent changes in the way companies are classified during survey processing are discussed in detail in a Bureau of the Census technical memorandum entitled "Reclassification of Companies in the 1992 Survey of Industrial Research and Development for the Generation of the 'Analytical' Series" Oct. 25, 1994.

¹⁹ U.S. Department of Commerce, Bureau of the Census, Documentation of the Survey Design for the Survey of Industrial Research and Development: A Historical Perspective (Washington, DC, 1995).

²⁰ Of the \$11.4 billion increase in the revised 1991 nonmanu-facturing R&D total, the 25 industry groups newly added to the survey frame accounted for over \$2.0 billion in R&D expenditures.

Table B-11. 1991 total (company, Federal, and other) funds for industrial R&D performance from the 1991 and 1992 surveys

| (3) - (2) (4) (5) (5) (7) (6) (83) (83) (93) (9) (1,465 (957 (968) (366) | | \$116,952 (3) \$116,952 (D) (D) (D) (D) (D) (D) (D) (D) (D) (D) | R&D from 1992 survey (3) (3) |
|--|---------------|---|---|
| \$14,706 (83) (93) (D) (D) 1,465 957 874 (366) | | | \$102,246 \$11 1,360 (D) (D) (D) (D) (D) (D) (D) (D) |
| \$14,706 (83) 39 (D) 1,465 957 874 (366) | | \$116,952 1,277 (D) (D) 14,648 5,390 (D) (D) (D) (D) (D) (D) (D) (D) | 6 |
| 1, 1, | | \$116,952 1,277 (D) (D) 14,648 5,390 (D) (D) (D) (D) (D) (D) (D) | 21 |
| ÷ & | | 1,277 (D) (D) (D) (D) (D) (D) (D) (D) (D) (D) | 7 |
| 9) | | 5,390 (D) (D) (D) (D) (D) | |
| | | 2,498 (D (D) | |
| 253 (D) (352) (122) | 554 | | |
| (103) | <u> </u> | 55 | (a) (a) (a) (b) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c |
| 218 (314) | 974 775 | 974 14,775 | 756 9. 15,089 14,7 |
| (124) | 60 | 11,309 3,466 | 11,433 3,656 3,4 |
| (3,864) | 15 | 13,415 | 17,279 |
| (5,657) (5,923) (5,923) (5,923) (5,923) (5,923) (5,923) (6,923) (7,923 | <u>0</u> 2600 | (D) 4,787, (D) (D) | 78 10,444 5,321 (1,436 |
| 8 (4,663) (3,877) | 58 | 27,428 | 32,091 |
|) 372 2 28 (22) 9 (5,063) (3,857) | 668 | (D) (D) 16,629 | (D) (C) (C) (C) (C) (C) (C) (C) (C) (C) (C |

See explanatory information and SOURCE at end of table.

Table B-11. 1991 total (company, Federal, and other) funds for industrial R&D performance from the 1991 and 1992 surveys

| Fage 2 of 2 | | New sample | (/) | | \$891 | 467 | 422 | 207 11,421 |
|----------------------|-------------------|---|-----|-----------------------|---|---|---|--|
| Descone for revision | OIS IOI IEVISIOII | Data revisions | (9) | | \$93 | (Q) | (D) | 28 |
| 3000 | C DOC | Industry shifts | (5) | [8] | \$1,100 | 2,154 | (1,054) | (86) 6,935 |
| | | Net revision to 1991 estimate (3) - (2) | (4) | [Dollars in millions] | \$2,084 | (D) | (D) | 18,804 |
| Total R&D | | om om rvey | (2) | | \$8,705 | (Q) | (Q) | (D) 28,446 |
| | | 1991 total R&D from 1991 survey | (7) | | \$6,621 | 2,150 | 4,471 | (D) 9,642 |
| | | SIC code | | | 38 | 381-82 | 383-87 | 27,31,39 10-11,14-17,40- 42,44-51,53-54, 56,60,62-63,72- 73,78,806-07,87 |
| | | Industry (4) | (1) | | Professional and scientific instruments | Scientific and mechanical measuring instruments | opical, surgical, procedupline, and other instruments | Other manufacturing industries |

^{1/} The difference between the two sets of 1991 estimates can be accounted for by companies that have switched industries (column 5), companies that have revised their data (column 6), and sampling variation (column 7).

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.(S) = Data have been withheld because of imputation of more than 50 percent.

because it included a larger number of industries, especially among nonmanufacturing classifications, and potentially a larger number of firms, especially small firms, in all classifications. Comparing the 1991 panel and the 1992 sample, the sample reflected changes in the universe that could not be accounted for by the panel. The frame for the sample included industries that were not represented previously under the assumption that companies in those industries contributed little or no R&D activity.²¹ Further, data for small R&D performers were imputed for the panel years and used in the original 1991 statistics. The revised 1991 estimates from the 1992 survey included actually reported data for many more small companies.

Linking Current-Year Statistics with Statistics from Previous Surveys Time Series Analyses

As discussed earlier, the statistics resulting from the survey are better indicators of changes in, rather than absolute levels of, R&D spending and personnel. Nevertheless, the statistics are often considered as a continuous time series that has been prepared using the same collection, processing, and tabulation methods. Such uniformity of perparation has not been the case. Since the survey was first fielded, improvements have been made to increase the reliability of the statistics and to make the survey results more useful. To that end, existing practices have been changed and new procedures have been instituted. Preservation of the comparability of the statistics has been an important consideration when improvements have been made, however. Changes to survey definitions, the industry classification system, and the procedure used to assign industry codes to multiestablishment companies²² have had some, though not substantial, effects on the comparability of statistics.²³ The aspect of the

survey that had a greater effect on comparability was the selection of samples at irregular intervals (i.e., 1967, 1971, 1976, 1981, 1987, 1992) and the use of a subset or panel of the last sample drawn to develop statistics for intervening years. As discussed above, this practice introduced cyclical deterioration of the statistics.

To compensate for this deterioration, periodic revisions have been made to the statistics produced from the panels surveyed between sample years. Early in the survey's history, various methods were used to make these revisions.²⁴ Since 1976, a linking procedure called "wedging" has been used.²⁵ Simply described, in wedging the 2 sample years on each end of a series of estimates serve as benchmarks in the algorithms used to adjust the estimates for the intervening years.

Wedging Methodology

For a full discussion of the mathematical algorithm used for the wedging process that linked statistics from the 1992 survey with those from the 1987 survey, see the technical memorandum cited below.²⁶ In general, the memorandum states that wedging—

takes full advantage of the fact that in the first year of a new panel [when a new sample is selected], both current year and prior-year estimates are derived. Thus, two independent estimates exist for the prior year. The estimates from the new panel are treated as superior primarily because the new panel is based on updated classifications [the industry classifications in the prior panel are frozen] and is more fully representative of the current universe (the prior panel suffers from panel deterioration, especially a lack of birth updating). The limitations in the prior panel

²¹ That assumption could not be verified, nor an informed change made to it, because these companies were not surveyed in panel years.

²² For discussions of each of these, see the Bureau of the Census technical memorandum entitled "Wedging Considerations for the 1992 Research and Development (R&D) Survey," June 10, 1994.

²³ See the Bureau of the Census technical memoranda entitled "Reclassification of Companies in the 1992 Survey of Industrial Research and Development (R&D) for the Generation of the 'Analytical' Series," Oct. 25, 1994 and "Effects of the 1987 SIC Revision on Company Classification in the Survey of Industrial Research and Development (R&D)," Dec. 6, 1993.

²⁴ See U.S. Department of Commerce, Bureau of the Census, Documentation of the Survey Design for the Survey of Industrial Research and Development: A Historical Perspective (Washington, DC, 1995).

²⁵ The process was dubbed "wedging" because of the wedgelike area produced on a graph that compares originally reported statistics with the revised statistics that result after linking.

²⁶ Bureau of the Census technical memorandum, "Wedging Considerations for the 1992 Research and Development (R&D) Survey," June 10, 1994.

caused by these factors are naturally assumed to increase with time, so that in the revised series, we desire a gradual increase in the level or revision over time which culminates in the real difference observed between the two independent sample estimates of the prior year. At the same time, we desire that the annual movement of the original series be preserved to the degree possible in the revised series.

To that end, the wedging algorithm does not change estimates from sample years and adjusts estimates from panel years, recognizing that deterioration of the panel is progressive over time.

Wedged Versus Not-Wedged Statistics

One of the primary reasons for the decision to select a new sample annually rather than at irregular intervals was to avoid the necessity to apply global revision processes like wedging. Consequently, the 1992 survey is intended to be the last one for which wedging is an issue. For users who are interested, 18 of the detailed statistical tables in section A are reproduced below. Tables N-1 through N-18 are identical to the

section A tables except that they contain statistics that are not wedged for 1988-90.

Revisions to Historical Statistics

Throughout the history of the survey, during regular survey processing, all immediate prior-year statistics have been subject to revision with results from the current year's survey. Changes to older statistics, however, usually have been limited to revisions because of changes in the industry classification of companies caused by changes in payroll composition detected when a new sample was drawn. Various methodologies have been adopted over the years to revise, or backcast, the data when revisions to historical statistics have become necessary.

Documented revisions to the historical statistics from post-1967 surveys are summarized in *Research* and *Development in Industry: 1991* (NSF 94-325). Detailed descriptions of the specific revisions made to the statistics from pre-1967 surveys are scarce. However, summaries of some of the major revisions are included in the technical paper cited below.²⁷

²⁷ U.S. Department of Commerce, Bureau of the Census, Documentation of the Survey Design for the Survey of Industrial Research and Development: A Historical Perspective (Washington, DC, 1995)

Table N-1. Trends in industrial R&D performance, by source of funds: 1953-92

[Dollars in millions]

Page 1 of 1

| | | | | | | Page 1 of 1 |
|--------------|--------------------|-----------------------------|--------------------|-----------------------------|--------------------|-----------------------------|
| | Total R | &D | Fede | ral | Compan | y 1/ |
| Year | Current dollars | Constant 1987 dollars | Current dollars | Constant 1987 dollars | Current dollars | Constant 1987 dollars |
| 1953 | \$3,630 | \$16,500 48,333 | \$1,430 1,750 | \$6,500 7,883 | \$2,200 2,320 | \$10,000 10,450 |
| 1954 | 4,070 | 18,333 | 1,750 | 7,003 | 2,320 | 10,430 |
| 1955 | 4,640 6.605 | 20,262 27,987 | 2,180 3,328 | 9,520 14,102 | 2,460 3,277 | 10,742 13,886 |
| 1956 | 7.731 | 31,684 | 4,335 | 17,766 | 3,396 | 13,918 |
| 1958 | 8,389 | 33,691 | 4,759 | 19,112 | 3,630 | 14,578 |
| 1959 | 9,618 | 37,570 | 5,635 | 22,012 | 3,983 | 15,559 |
| 1960 | 10,509 | 40,419 | 6,081 | 23,388 | 4,428 | 17,031 |
| 1961 | 10,908 | 41,475 | 6,240 | 23,726 | 4,668 | 17,749 |
| 1962 | 11,464 | 42,617 | 6,434 | 23,918 | 5,029 | 18,695 |
| 1963 1964 | 12,630 13,512 | 46,434 48,780 | 7,270 7,720 | 26,728 27,870 | 5,360 5,792 | 19,706 20,910 |
| 1965 | 14.185 | 49.947 | 7,740 | 27,254 | 6.445 | 22.694 |
| 1966 | 15,548 | 52,884 | 8,332 | 28,340 | 7,216 | 24,544 |
| 1967 | 16,385 | 54,076 | 8,365 | 27,607 | 8,020 | 26,469 |
| 1968 | 17,429 | 54,808 | 8,560 | 26,918 | 8,869 | 27,890 |
| 1969 | 18,308 | 54,814 | 8,451 | 25,302 | 9,857 | 29,512 |
| 1970 | 18,067 | 51,327 | 7,779 | 22,099 | 10,288 | 29,227 |
| 1971 | 18,320 | 49,380 | 7,666 | 20,663 | 10,654 | 28,717 |
| 1972 | 19,552 | 50,392 | 8,017 8,145 | 20,662 19,722 | 11,535 13,104 | 29,729 31,729 |
| 1973 | 21,249 22,887 | 51,450 50.973 | 8,145 | 18,307 | 14,667 | 32,666 |
| 1974 | | | | | | |
| 1975 | 24,187 | 49,161 | 8,605 | 17,490 | 15,582 | 31,671 |
| 1976 | 26,997 | 51,620 | 9,561 | 18,281 18,757 | 17,436 19.340 | 33,338 34,597 |
| 1977 | 29,825 33,304 | 53,354 55,231 | 10,485 11,189 | 18,556 | 22.115 | 34,59 <i>1</i> 36,675 |
| 1979 | 38,226 | 58,271 | 12,518 | 19,082 | 25,708 | 39,189 |
| 1980 | 44,505 | 62,071 | 14,029 | 19,566 | 30,476 | 42,505 |
| 1981 | 51,810 | 65,665 | 16,382 | 20,763 | 35,428 | 44,902 |
| 1982 | 58,650 | 69,988 | 18,545 | 22,130 | 40,105 | 47,858 |
| 1983 | 65,268 | 74,849 | 20,680 | 23,716 | 44,588 | 51,133 |
| 1984 | 74,800 | 82,198 | 23,396 | 25,710 | 51,404 | 56,488 |
| 1985 | 84,239 | 89,236 | 27,196 | 28,809 | 57,043 | 60,427 |
| 1986 | 87,823 | 90,633 | 27,891 | 28,783 | 59,932 | 61,849 61,403 |
| 1987 | 92,155 97,889 | 92,155 94,215 | 30,752 32,117 | 30,752 30,911 | 61,403 65,772 | 63,303 |
| 1988 1989 | 101,854 | 93,875 | 31,292 | 28,841 | 70,562 | 65,034 |
| 1990 | 104,606 | 92,327 | 30,626 | 27,031 | 73,980 | 65,296 |
| 1991 | 116,952 | 99,449 | 26,372 | 22,425 | 90,580 | 77,024 |
| 1992 | 121,314 | 100,342 | 24,660 | 20,397 | 96,654 | 79,945 |
| | | | | | | |

^{1/} Company funds include funds for industrial R&D work performed within company facilities from all sources except the Federal Government. The funds may be the companies' own or from outside organizations such as research institutions, universities and colleges, nonprofit organizations, other companies, and state governments. Company-financed R&D not performed within the company is excluded.

NOTE: 1987 gross domestic product implicit price deflators were used to convert current dollars to constant dollars.

Table N-2. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1982-92

| | | | | | | | | | | | | Page 1 of 2 |
|---|------------------------------------|---------------------------------|------------------------------|-----------------------------------|-----------------------------------|----------------------------|-------------------------------------|--|--------------------------------|------------------------------------|--------------------------------------|--------------------------------------|
| | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| | | | | | | <u>Q</u> | [Dollars in millions] | | | | | |
| Total | | \$58,650 | \$65,268 | \$74,800 | \$84,239 | \$87,823 | \$92,155 | \$97,889 | \$101,854 | \$104,606 | \$116,952 | \$121,314 |
| | | | *** | | • | | | | | | | |
| Food, kindred, and tobacco products 1/ | 20,21 22,23 24,25 26 | (D) 159 566 6,604 | (D) 152 (D) 7,185 | (D) (D) 143 (D) 7,927 | (D) 147 (D) (D) 8,540 | (D) 144 (D) 8,843 | 1,206 (D) 137 (D) 9,635 | (0) (0) (0) (0) (0) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1 | (D) 172 686 11,466 | (D) (D) 183 730 72,344 | 1,277 (D) (D) (D) 14,648 | 1,411 277 (D) (D) 16,711 |
| Industrial chemicals | 281-82,286 283 284-85,287-89 | 3,206 (D) (D) | 3,214 (D) (D) | 3,240 (D) (D) | 3,498 (D) (D) | 3,552 3,658 1,633 | 3,716 (D) (D) | 3,959 4,746 2,067 | 4,039 (D) (D) | 4,337 (D) (D) | 5,390 (D) (D) | 5,406 8,831 2,474 |
| Petroleum refining and extraction | 13,29 30 32 33 | (D) (D) (D) (D) (D) | (D) (D) (D) 1,085 | <u> </u> | <u> </u> | 00000 | 1,897 (D) 995 730 | 1,944 (D) (D) 663 | 2,066 (D) (D) 749 | 2,129 (O) (O) (O) | 2,498 (D) (D) 714 | 2,339 (D) (D) 555 |
| Ferrous metals and products | 331-32,3398-99 333-36 | <u>0</u> 0 | <u>0</u> 0 | 336 336 | (D) 416 | (D) 458 | <u>0</u> 0 | 258 405 | <u> </u> | <u>0</u> 0 | <u>ê</u> ê | <u>0</u> 0 |
| Fabricated metal products | 34 | 625 8,078 | 701 | 842 10,504 | 829 12,216 | 895 (D) | 783 (D) | 829 (D) | 800 14,635 | 778 14,696 | 974 14,775 | 1,057 15,135 |
| Office, computing, and accounting machines | 357 351-56,358-59 | <u>0</u> 0 | <u>0</u> 0 | <u>0</u> 0 | <u>@</u> @ | (D) 2,396 | (D) 2,428 | (D) 2,719 | <u>ê</u> ê | <u>0</u> 0 | <u>ê</u> ê | <u>0</u> 0 |
| Electrical equipment | 36 | 10,923 | 12,681 | 13,778 | 14,432 | 14,980 | 15,848 | 16,242 | 16,929 | 17,723 | 13,415 | 13,546 |
| Radio and TV receiving equipment | 365 366 367 361-64,369 | (D) 5,839 1,740 (D) | (D) 7,298 2,169 (D) | (D) 8,685 2,831 (D) | (D) 9,397 3,385 (D) | 133 9,669 (D) | 139 10,184 4,286 1,239 | 139 10,296 4,607 1,200 | 84 10,539 4,990 1,316 | 93 10,770 5,432 1,428 | (D) 4,787 (D) (D) | (D) 3,678 (D) |
| | 37 | (Q) | 0 | <u>Q</u> | (D) | 31,275 | 34,246 | 36,338 | 36,844 | 36,019 | 27,428 | 26,484 |
| Motor vehicles and motor vehicles equipment Other transportation equipment | 373-75,379 372,376 372,376 | 4,797 (D) 14,451 | 5,318 (D) 15,406 | 6,057 (D) 18,858 | 6,984 (D) 22,231 | (D) 21,050 | (D) (D) 24,458 | (D) 25,900 | (D) 25,638 | (D) (D) 25,356 | (D) (D) 16,629 | (D) (D) 16,119 |
| 1 | | | | | | | | | | | | |

See explanatory information and SOURCE at end of table.

Table N-2. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1982-92

| | | | | | | | | | | | | Page 2 of 2 |
|---|---|--------------|--------------|--------------|---------------|--------------|-----------------------|--------------|--------------|--------------|---------------|-----------------|
| Industry and size of company | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| | 1 | | | | | 0] | [Dollars in millions] | | | | | |
| Distribution by industry | | | | | | | | | | | | |
| Professional and scientific instruments | 38 | \$3,930 | \$4,266 | \$4,602 | \$5,013 | \$5,103 | \$5,222 | \$5,426 | \$5,743 | \$6,194 | \$8,705 | \$9,652 |
| Scientific and mechanical measuring instruments. | 381-82 | (Q) | <u>(</u>) | (D) | (D) | <u>0</u> | <u>Q</u> | 1,734 | 1,868 | 2,096 | <u>Q</u> | 5,256 |
| optical, surgical, priotographic, and other instruments | 384-87 | (<u>Q</u>) | (Q) | (Q) | (D) | Q) | (Q) | 3,692 | 3,875 | 4,098 | (Q) | 4,396 |
| Other manufacturing industries 1/Nonmanufacturing industries 2/ | 27,31,39 | (D) 2,472 | (D) 3,337 | (D) 4,905 | (D) 6,714 | 382 7,446 | (D) 7,844 | (D) 8,113 | (D) 8,286 | (D) 9,274 | (D) 28,446 | (D) 30,103 |
| | 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 | | | | A A Maraksure | ** | | | | | | |
| Distribution by size of company [Based on number of employees] | | | | | | | | | | | | |
| Total | | \$58,650 | \$65,268 | \$74,800 | \$84,239 | \$87,823 | \$92,155 | \$97,889 | \$101,854 | \$104,606 | \$116,952 | \$121,314 |
| Fewer than 500 3/ 500 to 999 4/ | | 2,934 N/A | 4,422 N/A | 4,402 | 5,866 | 7,071 | 7,163 | (S) 1,656 | 7,620 | (S) 1.976 | 13,172 | 14,496 8,410 |
| 1,000 to 4,999 5 000 to 9,999 | | 3,864 | 4,178 | 5,520 | 6,240 | 7,472 | 7,262 | 7,598 | 7,696 | 7,786 | 10,453 | 12,415 |
| 10,000 to 24,999 | | 7,943 | 9,499 | 11,351 | 11,109 | 10,493 | 12,043 | 11,473 | 10,185 | 11,598 | 15,770 | 16,419 |
| 25,000 or more | | 41,156 | 44,372 | 48,837 | 55,354 | 56,991 | 59,461 | 64,677 | 68,962 | 68,852 | 61,508 | 60,902 |
| | | | | | | | | | | | | |

^{1/} Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."
2/ Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.
3/ Data for 1982-83 are for companies with fewer than 1,000 employees.
4/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY:

⁽D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

N/A = Not available

Table N-3. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1982-92

| | | | | | | | | | | | | Page 1 of 2 |
|--|-------------------------------------|-----------------------------------|-----------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--|--|
| Industry and size of company | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| | | | | | | [Dol | Dollars in millions] | | | | | |
| Total | | \$40,105 | \$44,588 | \$51,404 | \$57,043 | \$59,932 | \$61,403 | \$65,772 | \$70,562 | \$73,980 | \$90,580 | \$96,654 |
| Distribution by industry: | | | | | | | | | | | | |
| Food, kindred, and tobacco products 1/ | 20,21 22,23 24,25 26 28 | 777 136 159 566 6,197 | 824 150 152 552 6,792 | 1,081 182 143 594 7,736 | 1,136 218 147 576 8,310 | 1,280 246 144 538 8,664 | 1,204 243 137 604 9,445 | 1,192 210 156 664 10,573 | 1,284 (S) 172 686 11,383 | 1,308 242 183 730 12,277 | 1,277 236 200 1,174 14,439 | 1,411 259 (D) 1,191 16,420 |
| Industrial chemicals | 281-82,286 283 284-85,287-89 | 2,810 2,473 914 | 2,828 2,896 1,068 | 3,057 3,310 1,369 | 3,281 3,481 1,548 | 3,374 3,657 1,633 | 3,531 4,095 1,819 | 3,763 4,743 2,067 | 3,960 5,164 2,259 | 4,272 5,366 2,638 | 5,225 6,947 2,267 | 5,152 8,822 2,447 |
| Petroleum refining and extraction | 13,29 30 32 33 33 | 2,003 617 472 711 | 2,074 638 586 701 | 2,245 671 705 683 | 2,194 659 825 730 | 1,971 655 941 786 | 1,883 596 985 711 | 1,923 635 826 642 | 2,050 678 863 715 | 2,113 730 894 801 | 2,487 (D) 455 706 | 2,330 1,337 479 542 |
| Ferrous metals and products | 331-32,3398-99 333-36 | 426 285 | 396 | 357 326 | 323 407 | 336 450 | 249 | 385 | 254 461 | 245 556 | 225 481 | 224 318 |
| P Fabricated metal products | 34 | 565 7,227 | 634 7,911 | 773 9,312 | 10,721 | 10,701 | 633 10,577 | 687 11,992 | 664 13,478 | 13,780 | 748 13,720 | 764 14,073 |
| Office, computing, and accounting machines | 357 351-56,358-59 | 4,944 2,283 | 5,634 | 7,011 | 8,418 | 8,380 | 8,193 | 9,371 | 10,780 2,698 | 11,073 | 10,419 | 10,650 3,423 |
| Electrical equipment | 36 | 6,682 | 8,158 | 9,037 | 9,271 | 9,767 | 10,449 | 11,061 | 11,641 | 12,131 | 8,865 | 689'6 |
| Radio and TV receiving equipment | 365 366 367 367-64,369 | 3,555 1,342 1,421 | 324 4,500 1,810 1,524 | 362 5,147 2,354 1,174 | 350 5,174 2,826 921 | 133 5,117 3,357 1,160 | 139 5,455 3,630 1,225 | 139 5,675 4,068 1,179 | 84 5,820 4,458 1,279 | 93 5,932 4,709 1,397 | (D) (S) 3,177 (D) | 93 3,435 3,428 2,733 |
| Transportation equipment | 37 | 8,621 | 8,991 | 10,406 | 12,092 | 13,567 | 13,462 | 14,162 | 15,083 | 14,992 | 14,858 | 15,726 |
| Motor vehicles and motor vehicles equipment Other transportation equipment Aircraft and missiles | 373-75,379 372,376 | 4,321 114 4,186 | 4,754 227 4,010 | 5,384 258 4,764 | 6,164 279 5,649 | 7,171 330 6,066 | 7,167 356 5,939 | 7,769 370 6,023 | 8,725 353 6,005 | 8,548 304 6,140 | 9,063 262 5,533 | (D) (D) 6,248 |

See explanatory information and SOURCE at end of table.

Table N-3. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1982-92

| | | | | | | | | | • | | - | Page 2 of 2 |
|--|--|--------------|--------------|----------|----------|----------|-----------------------|--------------|--------------|--------------|---------------|-----------------|
| Industry and size of company | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| | | | | | | [Do | [Dollars in millions] | | | | | |
| Distribution by industry: | | | | | | | | | | | | |
| Professional and scientific instruments | 38 | \$3,407 | \$3,816 | \$4,211 | \$4,622 | \$4,752 | \$4,950 | \$5,306 | \$5,630 | \$6,095 | \$6,840 | \$7,426 |
| Scientific and mechanical measuring instruments. | 381-82 | 1,363 | 1,605 | 1,671 | 1,596 | 1,521 | 1,598 | 1,710 | 1,858 | 2,086 | 3,017 | 3,108 |
| Optical, surgical, photographic, and other instruments | 384-87 | 2,044 | 2,211 | 2,540 | 3,026 | 3,231 | 3,352 | 3,596 | 3,772 | 4,009 | 3,823 | 4,318 |
| Other manufacturing industries 1/ | 27.31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 | 493 | 2,084 | 3,252 | 361 | 380 | 380 | 5,360 | 5,620 | 472 6,588 | (D) 22,941 | (0) 24,211 |
| Distribution by size of company [Based on number of employees] | | | | | | | | | | | | |
| Total | | \$40,105 | \$44,588 | \$51,404 | \$57,043 | \$59,932 | \$61,403 | \$65,772 | \$70,562 | \$73,980 | \$90,580 | \$96,654 |
| | | 2,411 N/A | 3,781 N/A | 3,781 | 5,127 | 6,203 | 6,200 | (S) 1,517 | (S) 1,660 | (S) 1,836 | 11,285 | 12,381 8,232 |
| 1,000 to 4,999 | | 3,241 | 3,438 | 4,618 | 5,249 | 6,243 | 6,281 | 6,441 | 6,646 | 6,827 | | 11,259 |
| 5,000 to 9,999 10,000 to 24,999 | | 6,448 | 7,228 | 8,546 | 8,366 | 8,489 | 9,681 | 9,668 | 8,948 | 9,936 | | 12,960 |
| | | 25,781 | 28,061 | 30,354 | 33,421 | 33,778 | 33,878 | 37,438 | 41,860 | 42,242 | | 44,001 |
| | | | | | | | | | | | | |

^{1/} Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."
2/ Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.
3/ Data for 1982-83 are for companies with fewer than 1,000 employees.
4/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

Company funds include all funds for industrial R&D work performed within company facilities from all sources except the Federal Government. The funds may be the companies' own or from outside organizations such as research institutions, universities and colleges, nonprofit organizations, other companies, and State governments. Company-financed R&D not performed within the company is excluded. NOTE:

 ⁽D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 N/A = Not available KEY:

Table N-4. Company-financed R&D performed outside the United States by U.S. domestic companies and their foreign subsidiaries, by selected industry: 1982-92

| Page 1 of 1 | 1992 | | \$9,981 | 68 2,683 | 1,042 | 119 41 20 98 1,450 | (D) 180 169 (D) 20 (D) | Q) | (D) 406 | 700 (D) 860 |
|-------------|----------|-----------------------|---------|--|---|--|----------------------------------|--------------------------|--|--|
| | 1991 | | \$9,147 | 66 2,401 | 1,009 | 107 38 20 86 1,476 | 2 151 164 334 | 2,402 | 2,166 236 | 656 467 778 |
| | 1990 | | \$7,727 | 1,990 | 547 1,443 | 71 263 30 65 1,580 | (D) 278 266 (D) | <u>Q</u> | (D) 277 | 563 187 114 |
| | 1989 | | \$6,814 | 1,504 | 508 996 | 45 (D) 26 46 1,515 | (D) 271 204 (D) | (Q) | (D) 614 | 449 179 108 |
| | 1988 | | \$6,295 | 1,501 | 781 | 1,360 689 | (D) 339 278 (D) | 1,801 | 1,469 | 393 145 95 |
| | 1987 | [Dollars in millions] | \$5,226 | 37 1,243 | 625 618 | (D) 18 1,233 432 | 189 204 39 | <u>(Q)</u> | (D) 237 | 317 138 64 |
| | 1986 | [Doll | \$4,624 | 1,071 | 579 492 | 26 (5) 951 (S) | (D) 150 25 | <u>(</u>) | (D) 182 | 212 141 27 |
| | 1985 | | \$3,650 | 75 | 399 | (D) (D) (D) (D) (D) (D) (D) | 0.01742 | 1,025 | <u> </u> | 169 125 18 |
| | 1984 | | \$3,633 | 70 | 385 | 101 60 21 740 | 38(0) | 206 | <u>0</u> 0 | 263 131 8 |
| | 1983 | | \$3,269 | 63 | 368 361 | 103 10 23 577 482 | E E% | 880 | EE | £ 85 95 10 10 10 10 10 10 10 10 10 10 10 10 10 |
| | 1982 | | \$3,094 | 682 | 319 | 133 10 9 25 494 467 | (T) | 843 | EE | 123 |
| | SIC code | | | 20,21 | 281-82,284-89 | 13.29 32.33 33.4 33.6 36.6 36.6 | 365 366 367 367-64,369 | 37 | 371,373-75,379 372,376 | 38 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 |
| | Industry | | Total | Food, kindred, and tobacco products 1/ | Industrial and other chemicals Drugs and medicines | Petroleum refining and extraction. Stone, clay, and glass products. Primary metals. Fabricated metal products. Machinery | Radio and TV receiving equipment | Transportation equipment | Motor vehicles and other transportation equipment. | Professional and scientific instruments |

^{1/} Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

KEY:

^{2/} Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

NOTE: Data are reported in current U.S. dollars.

 ⁽D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data not separately available, but are included in total.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-5. Federal funds for industrial R&D performance, by industry and size of company: 1982-92

| | | | 1 | | - | | | | | | - | | Page 1 of 2 |
|---------------------------------|---|-------------------------------------|---|--|------------------------|----------------------------|--------------------------|-------------------------|----------------------|---|---|---|---|
| | Industry and size of company | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| | | | | | | | [Dol] | [Dollars in millions] |] | | | | |
| • | Total | | \$18,545 | \$20,680 | \$23,396 | \$27,196 | \$27,891 | \$30,752 | \$32,117 | \$31,292 | \$30,626 | \$26,372 | \$24,660 |
| | Distribution by industry | | | | | | | | | | | | |
| Foo Tex Lur Pap Che | Food, kindred, and tobacco products 1/ | 20,21 22,23 24,25 26 26 | (D) 0 0 0 0 0 0 0 0 | (a) (b) (c) (a) (d) (d) (d) (d) (d) (d) (e) (d) (e) (e) (e) (e) (e) (e) (e) (e) (e) (e | 9 <u>6</u> , 9 <u></u> | 3,0 ° (2,0) | <u>6</u> 60005 | (C) 0 (D) 5 | 00008 | (C) | (<u>(</u> ()()()()()()()()()()()()()()()()()() | 20 (C) (O) 0 | 0 (8) (2) (8) 0 |
| ĞĞĞ | Industrial chemicals | 281-82,286 283 284-85,287-89 | 396 (D) (D) | 986(0) | 183 (D) (D) | 217 (D) | 178 | 185 (D) | 196 | £ (<u>0</u> (0) | \$ QQ | 0 0 0 0 | (S)(S) |
| Pet Stork Prin | Petroleum refining and extraction | 13,29 30 32 33 | (D) (D) 276 | (C)(C)(E)(E)(E)(E)(E)(E)(E)(E)(E)(E)(E)(E)(E) | <u> </u> | <u> </u> | <u> </u> | 4 <u>(0</u> 0 6 | 2002 | 34000 | <u> </u> | £ @@ | ° (2) (3) |
| A N | Ferrous metals and products | 331-32,3398-99 333-36 | <u>0</u> 0 | <u>0</u> 0 | 92 | (a) | <u>O</u> ® | <u>©</u> | 20 | <u>0</u> 0 | <u>@</u> @ | 7 | <u>0</u> 0 |
| Mac | Fabricated metal products | 34 | 60 851 | 1,116 | 1,192 | 1,495 | 95 (D) | 150 (D) | 142 (D) | 135 | 134 916 | 1,055 | 293 1,062 |
| ōŏ , | Office, computing, and accounting machines | 357 351-56,358-59 | <u>@</u> @ | <u>0</u> 0 | <u>@</u> @ | <u>@</u> @ | (D) 75 | <u>©</u> 4 | (D) | <u>0</u> 0 | <u>QQ</u> | <u>@</u> @ | <u>Q</u> Q |
| Ele | Electrical equipment | 36 | 4,241 | 4,523 | 4,741 | 5,161 | 5,213 | 5,399 | 5,181 | 5,288 | 5,592 | 4,550 | 3,857 |
| αζά <u>π</u> δ | Radio and TV receiving equipment | 365 366 367 361-64,369 | (D) 2,284 398 (D) | (D) 2,798 359 (D) | 3,538 477 (D) | (D) 4,223 559 (D) | 0 4,552 (D) (D) | 0 4,729 656 14 | 4,621 539 21 | 4,719 532 37 | 4,838 723 31 | ° <u>6</u> <u>6</u> <u>6</u> <u>6</u> | (C) |
| Tra | Transportation equipment | 37 | (a) | (D) | <u>(a)</u> | <u>Q</u> | 17,708 | 20,784 | 22,176 | 21,761 | 21,027 | 12,570 | 10,738 |
| ∑Ö₹ | Motor vehicles and motor vehicles equipment Other transportation equipment | 373-75,379 372,376 372,376 | 476 (D) 10,265 | 564 (D) 11,396 | 673 (D) 14,094 | 820 (D) 16,582 | (D) (D) 14,984 | (D) (D) 18,519 | (D) (D) 19,877 | (D) (D) 19,633 | (D) (D) 19,216 | (D) 11,096 | (D) (D) 9,872 |
| | | | | | | | | | | | | | |

See explanatory information and SOURCE at end of table.

Table N-5. Federal funds for industrial R&D performance, by industry and size of company: 1982-92

| | | | | | | | | | | | | Page 2 of 2 |
|--|---|---|---|--|---|---|---|---|---|---|---|---|
| Industry and size of company | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| | | | | | | °Q) | [Dollars in millions] | - | | | | |
| Professional and scientific instruments | 38 | \$523 | \$450 | \$391 | \$391 | \$351 | \$272 | \$120 | \$113 | 66\$ | \$1,865 | 2,226 |
| Scientific and mechanical measuring instruments. | 381-82 | (a) | 0 | (<u>Q</u>) | (D) | <u>(</u>) | (D) | (S) | (s) | (S) | (D) | 2,147 |
| Optical, surgical, protographic, and other instruments | 384-87 | 0 | (Q) | <u>(a)</u> | (D) | (a) | (D) | 96 | 103 | 88 | (Q) | 62 |
| Other manufacturing industries 1/ | 27.31.39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 83-84, 87, 89 | 1,000 | 1,253 | (D) 1,653 | (D) 2,313 | 2,706 | 2,700 | (D) 2,753 | (D) 2,666 | (D) 2,686 | 5,505 | (D) 5,892 |
| Distribution by size of company [Based on number of employees] | | | | | | | | | | | | |
| Total | | \$18,545 | \$20,680 | \$23,396 | \$27,196 | \$27,891 | \$30,752 | \$32,117 | \$31,292 | \$30,626 | \$26,372 | \$24,660 |
| Fewer than 500 3/ | | 523 N/A 623 527 1,495 15,377 | 641 N/A 740 718 2,271 16,311 | 621 98 902 487 2,805 18,483 | 739 117 991 672 2,743 21,933 | 868 137 1,229 796 2,004 23,213 | 963 115 981 748 2,362 25,583 | 864 139 1,157 914 1,805 27,239 | 987 1,050 1,050 811 1,237 27,102 | 975 (S) 959 280 1,662 26,610 | 1,887 181 1,050 816 3,373 19,065 | 2,115 1,178 1,156 851 3,459 16,901 |

^{1/} Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries." 3/ Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87. 3/ Data for 1982-83 are for companies with fewer than 1,000 employees.

4/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 N/A = Not available

Table N-6. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982-92

| Page 1 of 2 | 1992 | 4.2 | | 0.5 (D) (D) 1.1 6.0 | 4.6 10.7 3.1 | 6.00°. | <u>0</u> 0 | 1.6 7.8 | <u>0</u> 0 | 5.7 | <u>6</u> 627.6 | 7.0 | ©©#: |
|-------------|------------------------------|-------|---------------------------|--|---|---|--|---------------------------|---|----------------------|---|--------------------------|--|
| | 1991 | 4.2 | | 0.0 (C) 1.1.4.7 | 4.6 8.9 3.1 | 0.000 | <u>0</u> 0 | 1.5 | 99 | 6.5 | <u> </u> | 7.3 | (D) (D) 12.1 |
| | 1990 | 4.7 | | (D) (D) 0.7 0.8 5.6 | 4.7 (D) (D) | 2000 2000 | <u>0</u> 0 | 1.2 | <u>0</u> 0 | 6.9 | 3.1 7.7 9.8 2.4 | 8.8 | (D) (D) 14.3 |
| | 1989 | 4.6 | | (Ö) 0.7 0.7 5.4 | 4. (O) (O) | 0.000 | <u></u> | 1.2 | <u>0</u> 0 | 7.1 | 2.8 8.7 (D) | 9.0 | (D) (D) 15.3 |
| | 1988 | 4.7 | | 0000° | 9.0 3.5 3.5 | 0.00 | 0.6 | 1.3 (D) | (D) | 7.8 | 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0 | 8.9 | (D) (D) 15.6 |
| | 1987 | 4.6 | | 0.6 0.6 5.3 | 4.7 (0) (0) | 1.0 (D) 2.6 0.9 | <u></u> | 1.5 (D) | 3.0 3.0 | 8.2 | 3.2 10.2 10.0 2.7 | 8.7 | (D) (D) 14.7 |
| | 1986 | 4.7 | | (D) (D) (D) (D) (D) | 8.8 3.3 3.3 | (D) | (D) 1.5 | 1.5 (D) | 3.0 | 7.9 | 3.6 (O) (O) | 8.3 | (O) (D) 4.5. |
| | 1985 | 4.4 | | (D) 0.8 (D) 5.0 | 4; <u>©</u> <u>©</u> | 0000 | <u>0</u> + | 1.5 | <u> </u> | 7.6 | (D) 9.6 (D) | Q) | 3.8 (D) 14.9 |
| | 1984 | 3.9 | | (D) (D) (D) (D) 7.4 | 4. 0. 0. 0. 0. | <u> </u> | (D) | 6.4 | <u>0</u> 0 | 6.8 | (D) 8.6 7.8 (D) | (D) | 3.4 (D) 15.4 |
| | 1983 | 3.9 | | (C) | 8. (C) (C) | <u> </u> | <u>0</u> 0 | 1.4 | <u>0</u> 0 | 7.9 | (D) 11.5 7.7 (D) | A/N | 4.0 (D) 15.2 |
| | 1982 | 3.8 | | (C) (D) (D) (D) (D) (D) (D) (D) (D) (D) (D | 4.00 | 5005 | <u>0</u> 0 | 1.3 | <u> </u> | 7.2 | (D) 6.8 (D) | N/A | (D) 17.1 |
| | SIC code | | | 20,21 22,23 24,25 26,25 26 | 281-82,286 283 284-85,287-89 | 13,29 30 32 33 | 331-32,3398-99 333-36 | 34 35 | 357 351-56,358-59 | 36 | 365 366 367 361-64,369 | 37 | 373-75,379 372,376 |
| | Industry and size of company | Total | Distribution by industry: | Food, kindred, and tobacco products 1/ | Industrial chemicals. Drugs and medicines. Other chemicals. | Petroleum refining and extraction Rubber products | Ferrous metals and products Nonferrous metals and products | Pabricated metal products | Office, computing, and accounting machines Other machinery, except electrical | Electrical equipment | Radio and TV receiving equipment | Transportation equipment | Motor vehicles and motor vehicles equipment Other transportation equipment Aircraft and missiles |

See explanatory information and SOURCE at end of table.

Table N-6. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982-92

| Professional and scientific instruments. 381-82 1982 1984 1983 1984 | 1982 1983 | | | 4000 | 1000 | 1000 | 1001 | 1002 |
|--|-----------|-----|------------|---------|------|------|------|------|
| 381-82 (D) | 8.4 | | 1980 | 00061 | 6061 | 0661 | 100 | 700 |
| 384-87 (D) | | | 8.8 | 7.9 7.5 | 7.5 | 7.8 | 9.1 | 8.9 |
| 384-87 (D) | (a) | | | | | 9.5 | 10.0 | 10.5 |
| 1.8 2.5 2.9 (D) | (0) | | <u>(a)</u> | (D) 7.1 | 7.1 | 7.1 | 8.1 | 8.4 |
| 1.8 2.5 2.9 2.3 1.9 2.0 2.2 1.8 1.9 2.0 2.2 1.8 1.9 2.0 2.2 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 | (D) | 115 | | | (a) | (a) | (a) | Q) |
| 1.8 2.5 2.9 N/A N/A 2.0 2.2 1.9 2.0 2.2 1.3 1.3 1.7 1.7 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 | | | | | | 17.5 | | |
| 1.9 2.0 2.2 | 1.8 | | 4.1 | 3.9 3.6 | 3.7 | 3.7 | 3.3 | 3.2 |
| 1.7 | 0.1 | | 5.5 | | | 2.3 | 2.5 | 2.9 |
| 2.4 2.8 3.1 | 2.4 | | 3.2 | | | 2.9 | 3.6 | 3.5 |
| 5.4 5.5 5.3 | 5.4 | | 6.5 | | | 6.4 | 5.6 | 5.5 |

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries." 2/ Data for 1982-83 are for companies with fewer than 1,000 employees. 3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies. N/A = Not available

Table N-7. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982-92

| Page 1 of 2 | 1992 | 3.3 | 0.0 0.0 0.0 0.0 0.0 0.0 0.0 | 4.4 7.01 3.1 | 1.0 2.5 1.7 0.6 | 0.5 | 7.3 | 13.8 2.9 | 4.1 | 0.7 7.1 7.2 2.2 | 4.1 | 4.0 (S) 4.6 |
|-------------|------------------------------|--------------------------------|---|------------------------------------|-----------------------------------|-----------------------------|---------------------------|---|----------------------|---|--------------------------|--|
| | 1991 | 3.2 | 0.5 0.9 1.1 5.3 | 4.8 9.8 0.0 | 1.0 2.3 1.6 0.8 | 0.5 | 1.2 | 14.9 | 4.3 | 1.0 (S) 7.2 2.2 | 4.0 | 4.2.4 1.0.4 |
| | 1990 | 3.3 | 0.5 0.4 0.7 0.8 | 7.6 5.8 7.8 | 1.0 1.7 2.4 1.0 | 0.5 | 1.0 | 15.3 2.9 | 4.7 | 6.4.8.5.5.5.5.5.5.5.5.5.5.5.5.5.5.5.5.5.5 | 3.6 | 9. ± 8. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. |
| | 1989 | 3.2 | 0.5 0.4 0.7 0.7 5.3 | 9.4 9.1 4.8 | 1.0 1.7 2.3 0.9 | 0.6 | 1.0 | 13.5 | 4.9 | 2.8 5.3 8.0 2.0 | 3.7 | 9, 2, 8, 9, 6, 9, 8 |
| | 1988 | 3.1 | 0.0 0.4 0.7 0.7 0.5 | 9.0 9.0 3.5 | 1.0 2.2 0.8 | 1.1 | 1.0 | 3.1 | 5.3 | 6.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0 | 3.5 | 3.4 3.5 3.6 |
| | 1987 | 3.1 | 0.6 0.6 0.6 0.6 0.6 | 4.4 3.3 | 1.0 1.6 2.5 0.9 | 0.6 | 1.2 | 12.3 | 5.4 | 3.5 8.5 8.5 6.5 | 3.4 | 3.4 2.5 3.6 |
| | 1986 | 3.2 | 0.6 0.5 0.6 0.7 | 4.4 4.8 3.3 | 1.7.4.0. 1.0.4.1. | 0.7 | 7.3 | 12.4 | 5.1 | 3.6 5.2 2.2 2.2 | 3.6 | 3.3 2.7 4.0 |
| | 1985 | ന | 0.0 6.0 8.0 8.0 9.4 | 4.2 8.0 3.1 | 0.2 1.8 0.9 0.9 | 1.4 | 1.4 | 12.4 | 4.8 | 4.7.8.2. 6.4.2.0 | 3.4 | 3.1 |
| | 1984 | 2.6 | 0.5 0.7 0.8 0.8 | 3.8 8.2 2.9 | 0.7 1.9 1.9 0.9 | 0.6 | 1.4 5.8 | 10.5 | 4.5 | 3.7 5.1 6.6 2.2 | 3.3 | 3.0 |
| | 1983 | 2.6 | 4.0 4.0 6.0 6.0 7.4 | 3.4 7.7 2.5 | 0.7 1.7 1.9 0.8 | 0.6 | 1.3 | 10.0 | 2.0 | 2.9 7.2 6.6 2.6 | A/N | 3.5 |
| | 1982 | 2.6 | 0.5 0.8 1.1 0.4 | 3.5 7.0 2.3 | 0.8 1.7 1.7 0.8 | 0.6 | 1.2 | 10.4 | 4.4 | 3.3 6.7 5.2 2.3 | N/A | 4.0 0.7 5.1 |
| | SIC code | | 20,21 22,23 24,25 26 28 | 281-82,286 283 284-85,287-89 | 13,29 30 32 33 33 | 331-32,3398-99 333-36 | 34. | 357 351-56,358-59 | 36 | 365 366 367 361-64,369 | 37 | 373-75,379 372,376 |
| | Industry and size of company | Total Distribution by industry | Food, kindred, and tobacco products 1/ | Industrial chemicals | Petroleum refining and extraction | Ferrous metals and products | Fabricated metal products | Office, computing, and accounting machines Other machinery, except electrical | Electrical equipment | Radio and TV receiving equipment | Transportation equipment | Motor vehicles and motor vehicles equipment Other transportation equipment |

See explanatory information and SOURCE at end of table.

Table N-7. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982-92

| Page 2 of 2 | 1992 | 7.2 | 6.2 | 8.2 | 1.0 | | 3.0 | 2.8 | 2.9 | 3.9 |
|-------------|------------------------------|---|--|--|-----------------------------------|--|-------------------|----------------|------------------|----------------|
| | 1991 | 7.1 | 6.3 | 8.0 | 0.8 | | 3.2 | 2.4 | 3.0 | 3.8 |
| | 1990 | 7.6 | 9.4 | 6.9 | 1.1 | | 3.6 | 3.0 | 2.6 | 3.9 |
| | 1989 | 7.3 | 8.5 | 6.9 | 1.0 | | 3.6 | 2.0 | 2.4 | 3.7 |
| | 1988 | 7.3 | 8.4 | 6.9 | 7: | | 3.6 | 2.1 | 2.6 | 3.8 |
| | 1987 | 7.5 | 8.1 | 7.2 | | | 3.8 | 2.4 | 2.5 | 8.8 |
| | 1986 | 8.2 | 8.4 | 8.0 | 1.2 | | 4.0 | 2.4 | 2.6 | 3.7 |
| | 1985 | 8.3 | 8.4 | 8.1 | 1.0 | | 3.4 | 2.4 | 2.5 | 3.5 |
| | 1984 | 7.6 | 8.3 | 7.3 | 1.1 | | 2.8 | 2.0 | 2.5 | 3.2 |
| | 1983 | 7.7 | 8.8 | 7.1 | 1.0 | | 2.2 N/A | 2.0 | 2.3 | 3.4 |
| | 1982 | 7.3 | 7.6 | 7.1 | 0.8 | | 1.6 N/A | 1.7 | 2.0 | 3.3 |
| | SIC code | 38 | 381-82 | 384-87 | 27,31,39 | | | | | |
| | Industry and size of company | Professional and scientific instruments | Scientific and mechanical measuring instruments. | Optical, surgical, photographic, and other instruments | Other manufacturing industries 1/ | Distribution by size of company [Based on number of employees] | Fewer than 500 2/ | 1,000 to 4,999 | 10.000 to 24.999 | 25,000 or more |

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries." 2/ Data for 1982-83 are for companies with fewer than 1,000 employees. 3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.N/A = Not available

Table N-8. Total (company, Federal, and other) funds for performance of basic research, applied research, and development, in current and in constant dollars: 1953-92

[Dollars in millions]

Page 1 of 1

| | Tota | af | Basic res | search | Applied re | esearch | Develop | ment |
|--------|--------------------|-----------------------------|--------------------|-----------------------------|--------------------|-----------------------------|--------------------|-----------------------------|
| Year | Current dollars | Constant 1987 dollars | Current dollars | Constant 1987 dollars | Current dollars | Constant 1987 dollars | Current dollars | Constant 1987 dollars |
| 953 1/ | \$3,630 | \$16,500 | \$151 | \$686 | \$726 | \$3,300 | \$2,753 | \$12,51 13.91 |
| 954 1/ | 4,070 | 18,333 | 166 | 748 | 814 | 3,667 | 3,090 | 13,91 |
| 955 1/ | 4,640 | 20,262 | 189 | 825 | 928 | 4,052 | 3,523 | 15,38 |
| 956 | 6,605 | 27,987 | 253 | 1,072 | 1,268 | 5,373 | 5,084 | 21,54 |
| 957 | 7,731 | 31,684 | 271 | 1,111 | 1,670 | 6,844 | 5,790 | 23.73 |
| 1 | 8,389 | 33,691 | 295 | 1,185 | 1,911 | 7,675 | 6,183 | 24,83 |
| 958 | 9,618 | 37,570 | 320 | 1,250 | 1,991 | 7,777 | 7,307 | 28,54 |
| 959 | 9,010 | 37,370 | 320 | 1,230 | 1,001 | ,,,,, | 7,007 | 20,04 |
| 960 | 10,509 | 40,419 | 376 | 1,446 | 2,029 | 7,804 | 8,104 | 31,16 |
| 961 | 10,908 | 41,475 | 395 | 1,502 | 1,977 | 7,517 | 8,536 | 32,45 |
| 962 | 11,464 | 42,617 | 488 | 1,814 | 2,449 | 9,104 | 8,527 | 31,69 |
| 963 | 12.630 | 46,434 | 522 | 1,919 | 2,457 | 9,033 | 9,651 | 35,48 |
| 964 | 13,512 | 48,780 | 549 | 1,982 | 2,600 | 9,386 | 10,363 | 37,41 |
| 304 | 10,012 | 10,700 | | .,, | | | | |
| 965 | 14,185 | 49.947 | 592 | 2.085 | 2,658 | 9,359 | 10,935 | 38,50 |
| 966 | 15,548 | 52,884 | 624 | 2,122 | 2,843 | 9.670 | 12,081 | 41,09 |
| 967 | 16,385 | 54,076 | 629 | 2,076 | 2,915 | 9.620 | 12,841 | 42.38 |
| 968 | 17,429 | 54,808 | 642 | 2,019 | 3,124 | 9,824 | 13,663 | 42,96 |
| 969 | 18,308 | 54,814 | 618 | 1,850 | 3,287 | 9,841 | 14,403 | 43,12 |
| 969 | 10,500 | 34,014 | 010 | 1,000 | 0,201 | 0,011 | , | , |
| 970 | 18.067 | 51,327 | 602 | 1,710 | 3,427 | 9,736 | 14,038 | 39,88 |
| 971 | 18,320 | 49,380 | 590 | 1,590 | 3,415 | 9,205 | 14,315 | 38,58 |
| 972 | 19,552 | 50.392 | 593 | 1,528 | 3,514 | 9,057 | 15,445 | 39,80 |
| 973 | 21,249 | 51,450 | 631 | 1,528 | 3,825 | 9,262 | 16,793 | 40.66 |
| 974 | 22,887 | 50,973 | 699 | 1,557 | 4,288 | 9,550 | 17,900 | 39,86 |
| 77- | ,00, | | | | | | | |
| 975 | 24,187 | 49,161 | 730 | 1,484 | 4,570 | 9,289 | 18,887 | 38,38 |
| 976 | 26,997 | 51,620 | 819 | 1,566 | 5,112 | 9,774 | 21,066 | 40,27 |
| 977 | 29,825 | 53,354 | 911 | 1,630 | 5,636 | 10,082 | 23,278 | 41,64 |
| 978 1/ | 33.304 | 55.231 | 1,035 | 1,716 | 6,300 | 10,448 | 25,969 | 43,06 |
| 979 | 38,226 | 58,271 | 1,158 | 1,765 | 7,225 | 11,014 | 29,843 | 45,49 |
| | | | | | | | | |
| 980 1/ | 44,505 | 62,071 | 1,325 | 1,848 | 8,450 | 11,785 | 34,730 | 48,43 |
| 981 | 51,810 | 65,665 | 1,614 | 2,046 | 10,699 | 13,560 | 39,497 | 50,06 |
| 982 1/ | 58,650 | 69,988 | 1,904 | 2,272 | 12,323 | 14,705 | 44,423 | 53,0 |
| 983 | 65,268 | 74,849 | 2,223 | 2,549 | 13,927 | 15,971 | 49,118 | 56,32 |
| 984 | 74,800 | 82,198 | 2,608 | 2,866 | 15,765 | 17,324 | 56,427 | 62,00 |
| | | | | | | | | 00.00 |
| 985 | 84,239 | 89,236 | 2,862 | 3,032 | 18,255 | 19,338 | 63,122 | 66,86 |
| 986 | 87,823 | 90,633 | 4,047 | 4,176 | 19,759 | 20,391 | 64,017 | 66,06 |
| 987 | 92,155 | 92,155 | 4,324 | 4,324 | 19,813 | 19,813 | 68,018 | 68,01 |
| 988 | 97,889 | 94,215 | 4,243 | 4,084 | 20,757 | 19,978 | 72,889 | 70,15 |
| 989 | 101,854 | 93,875 | 4,646 | 4,282 | 22,388 | 20,634 | 74,820 | 68,95 |
| | 404.000 | 00.007 | 4.000 | 4 200 | 22 620 | 20.854 | 76,069 | 67.13 |
| 990 | 104,606 | 92,327 | 4,909 | 4,333 | 23,628 | | | 69.18 |
| 991 | 116,952 | 99,449 | 9,423 | 8,013 | 26,172 | 22,255 | 81,357 | |
| 1992 | 121,314 | 100,342 | 9,744 | 8,101 | 27,175 | 22,477 | 84,345 | 69,76 |

^{1/} Character-of-work estimates were made by the National Science Foundation. See: National Science Foundation, National Patterns of R&D Resources: 1992, Final Report, NSF 92-330.

NOTES: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

¹⁹⁸⁷ gross domestic product implicit price deflators were used to convert current dollars to constant dollars.

Table N-9. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry: 1982-92 and projected 1993

| Page 1 of 2 | 1987 1988 1990 1991 1993 | [Dollars in millions] | \$3,576 \$3,738 \$3,536 \$4,105 \$4,615 \$4,889 \$5,079 | (S) 27 (D) (D) (D) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | (D) | 914 989 989 966 1,416 1,401 1,395 (D) | | (D) (D) 14 49 2 (D) | (D) | 578 744 762 820 (D) (D) (D) | (a) (b) (c) (c) (c) (d) (d) (d) (e) (e) (e) (e) (e) (e) (e) (e) (e) (e | (S) (D) 847 (S) (S) (S) (S) | |
|-------------|--|-----------------------|---|--|---|---|-----------------------------|---|--|-----------------------------|--|-----------------------------|---|
| | 1986 | 11 | \$3,358 | % <u>@ @ @</u> % | (D) 2 | 999 (D) 74 | <u> </u> | (D) 261 | <u>Q</u> Q | (Q) | ° <u>@</u> @@ | (S) | <u> </u> |
| | 1985 | | \$3,954 | 2 1 3 162 162 | 662 | 0.00 (0.00) (0.00) | 26 (S) | 240 | 12 228 | 733 | 0 9 9 9 9 9 | (S) | <u> </u> |
| | 1984 | | \$4,446 | (S) 2 5 6 191 | 18 (0) (0) | 1,356 16 5 (S) | 35 (S) | (D) | (S) 179 | 752 | 0 (3) (3) (8) | <u>0</u> | <u>©</u> |
| | 1983 | | \$4,345 | (T) 5 3 345 | 335 (T) (T) | 1,284 17 7 92 | 35 57 | 31 163 | E4 | 813 | 0 150 82 581 | ε | E' |
| | 1982 | | \$4,240 | (E) 2 3 47 | 338 (1) | 1,162 14 17 101 | 22 79 | 54 183 | 16 167 | 831 | 5 155 40 631 | E | E, |
| | SIC code | | | 20,21 22,23 24,25 26 26 28 | 281-82,286 283 284-85,287-89 | 13,29 30 32 33 | 331-32,3398-99 333-36 | 34 | 357 351-56,358-59 | 36 | 365 366 367 367 361-64,369 | 37 | 371 |
| | Industry | | Total | Food, kindred, and tobacco products 1/ | Industrial chemicals | Petroleum refining and extraction | Ferrous metals and products | Fabricated metal products | Office, computing, and accounting machines | Electrical equipment | Radio and TV receiving equipment | Transportation equipment | Motor vehicles and motor vehicles equipment |

See explanatory information and SOURCE at end of table.

Table N-9. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry: 1982-92 and projected 1993

| | | | | | | | | | | | | ٦ | Page 2 of 2 |
|---|---|------|------|----------|----------|------------|-------------|-----------------------|----------|----------|----------|------------|-------------|
| Industry | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
| | | | | | | | [Dollars in | [Dollars in millions] | | | | | |
| Professional and scientific instruments | 38 | \$54 | \$45 | \$36 | <u>Q</u> | <u>(a)</u> | \$17 | \$16 | \$12 | \$11 | (S) | (S) | (s) |
| Scientific and mechanical measuring instruments | 381-82 | E | Ε | | (D) | (a) | <u>Q</u> | (<u>a</u>) | <u>Q</u> | (Q) | Q | (Q) | <u>(</u>) |
| Optical, surgical, procediaprinc, and outer instruments | 384-87 | E | E | <u>Q</u> | (a) | 0 | 0 | <u>Q</u> | <u>a</u> | <u>O</u> | <u>Q</u> | <u>(a)</u> | <u>Q</u> |
| Other manufacturing industries 1/ | 27,31,39 | 12 | 17 | 12 | 338 | 328 | 433 | 0 | (D) | (C) | (D) | (D) | 0 811 |
| | 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 | | | | } | | | | | } | } | } | |
| | | | | | | | | | | | | | |

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data not separately available but are included in total.

1/ Until 1984, tobacco products, SIC 21, was included with "Other manufacturing industries." 2/ Less than \$0.5 million.

Table N-10. Company and other (except Federal) funds for industrial energy R&D performance, by selected industry: 1982-92 and projected 1993

| \$2,687 \$2,691 (C) (S) (C) (D) (C) (S) (D) (C) (D) (C) (D) (C) (D) (C) (C) (C) (C) (C) (C) (C) (C) (C) (C |
|--|
| |

 ⁽D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld due to imputation of more than 50 percent.
 (T) = Data not separately available but are included in total. KEY:

Nonmanufacturing industries for 1990 and prior years included the following SICs only:
 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

Table N-11. Federal funds for industrial energy R&D performance, by selected industry: 1982-92 and projected 1993

| Page 1 of 1 | Projected 1993 | | (S) | <u>(a)</u> | 8 | (S) | 0 | <u>e</u> | ·m | (8) | • | | | | |
|-------------|-------------------|-----------------------|---------|------------|-----------------------------------|------------|----------------------|-----------------------|------------------------------------|--------------------------------|---------------|-------------------|-----------------|---------------|---------------|
| | 1992 | | \$2,077 | <u>(a)</u> | 7 | (S) | 0 | <u>0</u> | | 514 | | | | | |
| | 1991 | | \$1,924 | <u>Q</u> | 9 | (S) | 0 | <u>.</u> | - | 423 | | | | | |
| | 1990 | | \$1,418 | 16 | 3 | <u>(a)</u> | <u>(</u>) | 445 | <u>(a)</u> | 316 | | | | | |
| | 1989 | | \$1,265 | 31 | 4 | <u>(a)</u> | <u>@</u> | 368 | <u> </u> | 253 | | | | | |
| | 1988 | millions] | \$1,385 | <u>Q</u> | 9 | <u>Q</u> | 0 | 447 | <u>0</u> | (8) | • | | | | |
| | 1987 | [Dollars in millions] | \$1,166 | (D) | က | <u></u> | <u>@</u> | <u>Q</u> | 5 | 263 | | | | | |
| | 1986 | | \$1,191 | (D) | 42 | <u>(</u>) | 0 | 302 | 4 | <u>0</u> | • | | | | |
| • | 1985 | | \$1,417 | 0 | 54 | <u>0</u> | 662 | 417 | 13 | 254 | | | | | |
| | 1984 | | \$1,484 | 22 | <u>Q</u> | <u>a</u> | 629 | 471 | 52 | 235 | | | | | |
| | 1983 | | \$1,503 | 179 | 99 | E | 681 | E | E | 206 | | | | | |
| | 1982 | | \$1,478 | 169 | 99 | E | 685 | 264 | 83 | 211 | | | | | |
| | SIC code | | | 28 | 13,29 | 35 | 36 | 372,376 | | 07-10, 12-17, | 40-42, 44-49, | 50-59, 60-65, 67, | 701, 73, 75-76, | 78-79, 80-81, | 83-84, 87, 89 |
| | Industry | | Total | | Petroleum refining and extraction | Machinery | Electrical equipment | Aircraft and missiles | All other manufacturing industries | Nonmanufacturing industries 1/ | | | | | |

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data not separately available but are included in total.

^{1/} Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-12. Total (company, Federal, and other) funds for industrial energy R&D performance, by primary energy source: 1982-92 and projected 1993

[Dollars in millions]

| | | | | | | • | | | | | | Page 1 of 1 |
|---|--------------|-------------------------|---------|---------------------|------------|------------------|------------|------------------|--------------------------|---------------|--------------------|-------------------|
| Primary energy source | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | Projected 1993 |
| Total | \$4,240 | \$4,345 | \$4,446 | \$3,954 | \$3,358 | \$3,576 | \$3,738 | \$3,536 | \$4,105 | \$4,615 | \$4,889 | \$5,079 |
| Fossil fuels | 1,491 | 1,573 | 1,738 | 1,876 | 1,476 | 1,548 | 1,606 | 1,601 | 1,810 | 2,128 | (S) | (S) |
| Oil | 4444 2222 | 905 255 48 (T) | A A A A | 1,395 189 125 | A A A A | (S) 191 11 | A A A A | (3) 23 (3) | & | <u> </u> | 4 4 4 4 2 2 2 2 | A A A A |
| Synthetic fossil fuels Mining | | EEE | A A A | 111 8 31 | A A A | 23 3 (S) | A Z Z Z | 41 (S) (S) | 444 222 | <u>(8)(8)</u> | Y Y Y | A A A |
| Other fossil fuels | N/A | E | N/A | 17 | N/A | 51 | N/A | (S) | N/A | 28 | N/A | N/A |
| Nuclear | 1,078 | 1,118 | 1,113 | 1,212 | 979 | 926 | 1,097 | 943 | 1,065 | 1,139 | 1,191 | 1,359 |
| Fission. | N N N A | 973 145 | N/A | 1,062 | N N N N | 858 (S) | A/N A/N | 998 | A A | 1,134 | ZZ | Z Z Z A |
| Total geothermal, solar, and conservation and utilization | N/A | 1,424 | 1,218 | 471 | 504 | 421 | 497 | 582 | 594 | 998 | 1,029 | 966 |
| GeothermalSolar | A'X' | EE | ₹ ŽŽ | 96 | N/N N/A | 48 95 | Z Z Z | 16 (S) | N'N N'A | (S)(S) | N N A/A | N/A A/A |
| Conservation and utilization | A/N | E | N/A | 321 | N/A | 281 | A/N | 417 | N/A | (S) | N/A | N/A |
| All other energy | N/A | 230 | 377 | 395 | 399 | (S) | 538 | 410 | 636 | 202 | (S) | (S) |
| | | | | | | | | | | | | |

 ⁽S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data are not separately available, but are included in total.
 N/A = Not available KEY:

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

NOTE: Detailed data for 1983, 1985, 1987, and 1989 were estimated on the basis of (a) data actually reported in those years, (b) revised data for those years reported on the 1984, 1986, 1988 and 1990 survey forms, and (c) adjustments to new samples in 1987.

Table N-13. Company and other (except Federal) funds for industrial energy R&D performance, by primary energy source: 1982-92 and projected 1993

[Dollars in millions]

| \$2,762 \$2,842 \$2, 1,361 1,455 1, N/A (T) (T) (M/A (T) (T) (M/A (T) (T) (T) (T) (M/A (T) | 1985 | 1000 | | | | | | | Drojoctod |
|--|--|--------------------|--------------|--|------------|------------|----------|--------------------|--------------------|
| \$2,762 \$2,842 \$1. 1,361 1,455 1, N/A (T) | 0000 | 1987 19 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
| NA N | \$2,962 \$2,537 | \$2,167 | \$2,410 | \$2,353 | \$2,271 | \$2,687 | \$2,691 | \$2,812 | \$2,883 |
| EEEE EEE E 86 FF | 1,509 | (a) | (D) | 1,543 | (Q) | 0 | 1,869 | 1,918 | 1,953 |
| EEE E 88 KAN | N/A 1,381 N/A (D) N/A 124 N/A (S) | 4 4 4 4 Z Z Z Z | 8008 | 4 4 4 4 2 2 2 2 | <u> </u> | A A A A A | <u> </u> | A A A A Z Z Z Z | A A A A |
| (T) 89 99 90 N/A 71 N/A 19 | N/A 91 N/A 8 N/A (S) | Z Z Z | <u>(0</u> 00 | & & & & & & & & & & & & & & & & & & & | <u>©</u> | A A A | <u>©</u> | Y Y Y | 4 4 4 2 2 2 |
| 99 90 N/A N/A 19 | N/A 17 | N/A | (S) | Ą/Ż | (S) | N/A | (S) | N/A | A/A |
| N/A 71 | 101 150 | 94 | 109 | 118 | 8 | 180 | 46 | 09 | 208 |
| Total geothermal, solar, | N/A 135 N/A 15 | Y Z Z | (S) | ¥ ¥ X X | 57 | N/A N/A | 45 | Z Z | N N |
| utilization | 1,086 313 | (Q) | (a) | 319 | <u>(</u> 0 | <u>(</u> | 478 | 571 | 531 |
| Geothermal N/A (T) P Solar N/A (T) P Conservation and | N/A 27 N/A 51 | Z Z Z | (D) 44 | ¥ ¥ Z Z | <u>0</u> 0 | A A Z Z | (S)(S) | N/A N/A | ΧZZ |
| (£) | N/A 235 | N/A | (Q) | Ą/Z | 281 | N/A | (S) | N/A | A/N |
| All other energy N/A 150 | 267 277 | Q) | (Q) | 373 | <u>0</u> | 462 | 298 | 263 | 196 |

<sup>KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.
(T) = Data not separately available, but are included in total.
N/A = Not available</sup>

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Detailed data for 1983, 1985, 1987, 1989, and 1991 were estimated on the basis of (a) data actually reported in those years, (b) revised data for those years reported on the 1982, 1984, 1986, 1988, 1990, and 1992 survey forms and, (c) adjustments to new samples in 1981 and 1987. NOTE:

Table N-14. Federal funds for industrial energy R&D performance, by primary energy source: 1982-92 and projected 1993

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| Page 1 of 1 | Projected 1993 | (S) | (S) | X X X X | | N/A | \$1,151 | N/A N/A | (S) | A A X | A/N | (S) |
|-------------|-----------------------|---------|--------------|------------|--|--------------------|---------|----------------|---|------------------|------------------------------|------------------|
| | 1992 | \$2,077 | (S) | A A A A | N/N/N/N/N/N/N/N/N/N/N/N/N/N/N/N/N/N/N/ | N/A | 1,133 | NN | (S) | N/A N/A | N/A | 221 |
| - | 1991 | \$1,924 | (S) | <u> </u> | <u> </u> | (S) | 1,093 | 1,089 | (8) | 38 | (S) | (S) |
| | 1990 | \$1,418 | Q) | A A A A | A A A | N/A | 882 | Z Z Z Z | (Q) | N/N N/A | N/A | 174 |
| | 1989 | \$1,265 | (Q) | <u> </u> | 000 | (S) | 828 | 809 | (a) | <u>0</u> 0 | <u>O</u> | (a) |
| | 1988 | \$1,385 | 63 | ZZZZ | Z Z Z | N/A | 626 | N N N A | 178 | A A N/N | N/A | 165 |
| , | 1987 | \$1,166 | (<u>Q</u>) | (0) (0) 24 | * <u>()</u> () | - | 817 | 777 (S) | Q) | (D) 37 | (D) | (Q) |
| | 1986 | \$1,191 | <u>(a)</u> | A A A A A | 4 4 4 2 2 2 | Ϋ́Ν | 888 | Z Z Z | (a) | X X | N/A | (a) |
| | 1985 | \$1,417 | 78 | (S) 13 | 20 0 (S) | 0 | 1,063 | 928 | 158 | 26 45 | 87 | 118 |
| | 1984 | \$1,484 | 228 | A A A A | 4 4 4 2 2 2 | Z/A | 1,013 | N/N N/N | 132 | A K | Y/N | 110 |
| | 1983 | \$1,503 | 117 | E5-5 | EEE | 16 | 1,029 | 902 | 277 | EE | 80 | 80 |
| | 1982 | \$1,478 | 130 | A A A A A | 4 4 4 2 2 2 | N/A | 979 | N N N | Y/Z | 4 4 2 2 | N/A | N/A |
| | Primary energy source | Total | Fossil fuels | Oil | Synthetic fossil fuels | Other fossil fuels | Nuclear | FissionFission | Total geothermal, solar, and conservation and utilization | GeothermalSolar. | Conservation and utilization | All other energy |

 ⁽D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data not separately available, but are included in total.
 N/A = Not available KEY:

NOTE: Detailed data for 1981, 1983, 1987, and 1989 were estimated on the basis of (a) data actually reported in those years, (b) revised data for those years reported on the 1980, 1982, 1984, 1986, 1988, and 1990 survey forms, and (c) adjustments to new samples in 1981 and 1987.

Table N-15. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and size of company: 1983-93

| Industry and size of company | SIC code | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|--|-------------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|--|---|-----------------------------------|-----------------------------------|
| | | | | | | | [In thousands] | | | | | |
| Total (January) | | 540.9 562.5 | 584.1 603.3 | 622.5 646.8 | 671.0 | 695.8 | 708.6 | 720.2 | 730.9 | 704.1 | 779.3 | 787.1 N/A |
| Distribution by industry: | | | | | | | | | | | | |
| Food, kindred, and tobacco products 1/ | 20,21 22,23 24,25 26 28 | 7.7 2.2 1.8 7.6 67.3 | 7.4 2.3 (T) 6.6 69.8 | (S) 2.8 (S) 6.6 71.1 | (S) 2.6 (S) 6.4 75.8 | (S) 2.4 1.3 6.0 75.2 | (S) 2.4 1.3 6.1 75.8 | (S) 2.4 (S) 5.7 77.6 | 8.8 (S) (S) (S) (S) (S) (S) (S) | 9.4 (S) (S) 6.5 6.5 78.8 | 9.8 2.8 1.5 10.7 85.6 | 9.9 3.1 1.7 10.7 89.2 |
| Industrial chemicals Drugs and medicines Other chemicals | 281-82,286 283 284-85,287-89 | 26.6 28.2 12.1 | 25.6 (T) 13.4 | 23.5 30.8 16.7 | 24.9 31.8 19.1 | (S) 32.6 20.2 | (S) 33.0 20.3 | (S) 34.0 20.5 | (S) 33.5 22.4 | (S) 34.2 21.9 | 29.9 38.7 17.0 | 29.6 42.6 17.0 |
| Petroleum refining and extraction | 13,29 30 32 33 33 | (T) (T) 5.5 8.3 | 13.3 (T) 5.6 8.4 | 13.5 (S) 6.6 7.1 | 10.4 (S) 7.5 5.7 | 9.9 (S) 8.6 5.5 | 9.5 (S) 8.6 5.6 | (S) 8.5 5.7 | 10.2 (S) 8.6 (S) | 10.0 (S) 8.3 (S) | 11.5 14.8 5.3 5.3 | 11.5 14.0 15.3 16.0 |
| Ferrous metals and products | 331-32,3398-99 333-36 | 5.2 | 3.1 | 2.9 | 3.2 | (S) 3.4 | 3.3 | (S) | (S) | (8) | 1.7 (S) | 1.6 (S) |
| Fabricated metal products | 34 | (T) 79.6 | 16.6 | (S) 81.7 | (S) 89.7 | 9.9 95.8 | 10.5 | 9.7 | (S) 112.3 | (S) 107.2 | 8.7 99.3 | 8.2 99.4 |
| Office, computing, and accounting machines Other machinery, except electrical | 357 351-56,358-59 | 52.6 27.0 | 56.5 30.5 | 61.8 | 71.9 | 73.4 | 74.4 | 76.7 | 88.6 | 83.0 24.2 | 67.1 32.2 | 66.6 32.8 |
| Electrical equipment | 36 | 108.6 | 113.2 | 113.2 | 117.9 | 130.4 | 132.5 | 140.6 | 138.0 | 137.7 | 91.9 | 90.5 |
| Radio and TV receiving equipment Communication equipment Electronic components Other electrical equipment. | 365 366 367 361-64,369 | (T) 48.8 25.6 (T) | 59.3 (H8.4) | (S) 62.2 29.2 17.9 | 1.8 65.0 (S) 16.5 | 71.9 71.9 43.7 13.6 | 1.3 73.1 44.3 (S) | 1.3 72.8 (S) 16.7 | 0.6 74.2 48.5 (S) | 0.6 70.6 51.3 (S) | 1.0 31.2 28.4 31.2 | 1.0 (S) 29.5 29.1 |
| Transportation equipment | 37 | 134.3 | E | 160.3 | 179.2 | 187.3 | 188.2 | 193.0 | 183.7 | 167.8 | 141.1 | 144.7 |
| Motor vehicles and motor vehicles equipment Other transportation equipment | 373-75,379 372,376 | 29.0 2.2 103.1 | 28.6 (T) 111.5 | 28.7 (S) 130.2 | 33.9 (S) 144.8 | 46.5 (S) 136.3 | 47.3 (S) 136.4 | 45.9 (S) 142.3 | 49.6 (S) 128.5 | 45.5 (S) 117.9 | 44.5 (S) 92.9 | 45.2 (S) 95.0 |

See explanatory information and SOURCE at end of table.

Table N-15. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and size of company: 1983-93

| Academy and the second | | | | | | | | | | | | Page 2 of 2 |
|--|--|-------------|-------------|-------------|-------------|-------|----------------|-------------|-------------|------------|--------------|---------------|
| Industry and size of company | SIC code | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
| | | | | | | | [In thousands] | | | | | |
| Distribution by industry: | .• | | | | | | | | | | | |
| Professional and scientific instruments | 38 | E | E | (S) | (S) | (S) | (S) | (S) | (S) | (s) | (S) | (S) |
| Scientific and mechanical measuring instruments | 381-82 | E | ε | (S) | (s) | (S) | (S) | (S) | (S) | (8) | (S) | (S) |
| Optical, surgical, photographic, and other instruments | 384-87 | E | E | 19.8 | 24.0 | 24.6 | 24.9 | 24.2 | (S) | (S) | (S) | 21.0 |
| Other manufacturing industries 1/ | 27,31,39 | 5.9 | (F) 49.8 | (S) 66.8 | (S) 75.1 | 6.3 | 6.4 | 5.4 | (8)(8) | (S) (S) | 6.0 202.6 | 5.9 211.0 |
| | 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89 | | | | | | | | | | | |
| Distribution by size of company [Based on number of employees] | | | | | | | | | | | | |
| Total (January) | | 540.9 | 584.1 | 622.5 | 671.0 | 695.8 | 708.6 | 720.2 | 730.9 | 704.1 | 779.3 | 787.1 |
| Fewer than 500 3/ | | 52.7 N/A | 81.9 N/A | 78.3 | (S)(S) | 105.2 | 109.0 | (S) 17.9 | (S) 18.3 | (S) | 142.1 | 140.3 48.5 |
| 1,000 to 4,999 | | 48.3 | | | | | | 75.9 | 74.1 | | | 102.6 |
| 5,000 to 9,999 | | 29.8 | | | | | | 86.7 | 72.6 | | | 103.8 |
| 25,000 or more | | 325.8 | | ., | ., | | | 387.5 | 397.3 | | | 333.2 |
| and the second s | | | | | | | | | | | | |

^{1/} Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries." 2/ Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87. 3/ Data for 1983-84 are for companies with fewer than 1,000 employees. 4/ Until 1985, data were not broken down into this level of detail. See "Fewer than 500," above.

 ⁽S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data not separately available, but are included in total.
 N/A = Not available KEY:

Table N-16. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1982-92

| | | | | | | | ŀ | | | | 3 | Page 1 of 2 |
|--|------------------------------------|--|----------------------------------|-----------------------------------|----------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|--|----------------------------------|--|
| Industry and size of company | SIC code | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| Total | | \$111,600 | \$116,000 | \$124,000 | \$130,200 | \$128,500 | \$131,200 | \$137,000 | \$140,600 | \$145,800 | \$148,600 | \$154,900 |
| Food, kindred, and tobacco products 1/ | 20,21 22,23 24,25 26 | (D) (D) (S) 70,800 102,500 | (D) (S) (S) (D) (D) | (D) (115,400 (D) 112,500 | (D) 116,300 (D) 116,300 | (D) (S) (S) (D) 117,100 | (S) (D) (S) (D) 127,600 | (D) (D) (D) (D) (D) | (D) (D) (S) (S) 146,600 | (D) (S) (S) (S) (S) (S) | 130,000 (D) (D) 167,600 | 143,500 94,100 137,300 116,100 191,300 |
| Industrial chemicals | 281-82,286 283 284-85,287-89 | 122,100 (D) | 123,100 103,100 (D) | 132,000 (D) (D) | 144,600 (D) (D) | 150,200 113,600 83,100 | Ø <u></u> | (S) 141,700 101,300 | Ø <u>Q</u> Q | Ø <u>0</u> 0 | 181,000 (D) | 181,600 217,400 145,700 |
| Petroleum refining and extraction | 13,29 30 32 33 33 | (D) (D) 118,200 | (D) 75,400 (D) 129,900 | 0000 | <u> </u> | (D) 118,000 (D) | 195,600 (D) 115,700 131,500 | 196,400 (D) (D) 117,300 | 201,600 (D) (D) (S) | 209,900 (D) (D) (D) | 217,000 (D) (D) 142,200 | 203,300 89,800 111,100 |
| Ferrous metals and products | 331-32,3398-99 333-36 | <u></u> | <u>@</u> @ | (D) 112,000 | (D) 136,400 | (D) 138,800 | <u></u> <u> </u> | (S)(S) | <u>0</u> 0 | 00 | <u>0</u> 0 | 136,400 (S) |
| Fabricated metal products | 34 | (S) 103,800 | (S) 108,400 | 111,600 | 112,900 | ©(§) | 76,800 (D) | 82,100 (D) | (S) 138,400 | (S) 134,000 | 115,500 | 125,400 152,300 |
| Office, computing, and accounting machines Other machinery, except electrical | 357 351-56,358-59 | <u>0</u> 0 | <u></u> | <u>0</u> 0 | 66 | (D) 119,200 | (D) 104,700 | (D) 115,500 | <u>0</u> 0 | <u>0</u> 0 | <u>0</u> 0 | 172,900 110,300 |
| Electrical equipment | 36 | 100,000 | 114,300 | 121,700 | 124,900 | 120,700 | 120,600 | 118,900 | 121,600 | 128,500 | 147,100 | 148,600 |
| Radio and TV receiving equipment | 365 366 367 367-64,369 | (D) 123,300 69,600 (D) | 105,300 135,000 (S) (D) | (D) 143,000 100,500 (D) | (D) 147,800 114,100 (D) | 88,700 141,300 (D) | 111,200 140,500 97,400 (S) | 106,900 141,100 (S) 78,700 | 92,300 140,800 (S) | 164,600 148,700 108,800 (S) | 0000 | 94,400 (S) 126,900 158,600 |
| Transportation equipment | 37 | (Q) | <u>(Q)</u> | <u>(a)</u> | (a) | 170,700 | 182,400 | 190,700 | 195,700 | 205,000 | 189,400 | 185,300 |
| Motor vehicles and motor vehicles equipment | 373-75,379 372,376 | 162,600 (D) 148,800 | 184,700 114,200 143,600 | 211,400 (D) 156,000 | 223,100 (D) 161,700 | (D) (S) 149,800 | (D) (S) 179,400 | (D) (D) 185,900 | (D) (D) 189,400 | (D) 205,900 | (D) (T) (D) | 222,400 (S) 171,600 |
| | | | | | | | | | | | | |

See explanatory information and SOURCE at end of table.

Table N-17. R&D scientists and engineers per 1,000 employees in manufacturing companies, by industry and size of company: 1982-92

| Page 2 of 2 | 1992 | | (S) | (S) | 99 | 41 | | 61 | 40 | 38 | 41 | 62 |
|-------------|------------------------------|--------------------------|---|---|--|-----------------------------------|---|-----------------------------------|----------------|----------------|------------------|----------------|
| | 1991 | | (S) | (8) | (S) | 14 | | 56 | 8 | 38 | 36 | 99 |
| | 1990 | | 72 | 107 | 54 | 16 | | 59 | 30 | 37 | 33 | 99 |
| | 1989 | | 76 | 106 | 09 | 16 | | 59 | 30 | 39 | 31 | 62 |
| | 1988 | | 70 | 94 | 58 | 18 | | 58 | 31 | 59 | 34 | 58 |
| | 1987 | | 71 | 85 | 63 | 18 | | 59 | 30 | 53 | 32 | 22 |
| | 1986 | | (S) | (S) | 61 | (S) | | 59 | 32 | 28 | 33 | 26 |
| - | 1985 | | (S) | (S) | 70 | (S) | | 50 | 26 | 19 | 30 | 49 |
| | 1984 | | (8) | (S) | (S) | (S) | | 42 | 24 | 19 | 58 | 47 |
| | 1983 | | (S) | (S) | (S) | (S) | | 8 8 8 8 | 25 | 22 | 56 | 42 |
| | 1982 | | (S) | (S) | (S) | 6 | | 30 | 22 | 23 | 56 | 43 |
| | SIC code | | 38 | 381-82 | 383-87 | 27,31,39 | | | | | | |
| | Industry and size of company | Distribution by industry | Professional and scientific instruments | Scientific and mechanical measuring instruments | Optical, surgical, protographic, and other instruments | Other manufacturing industries 1/ | Distribution by size of company [Based on number of employees] | Less than 500 2/ 500 to 999 3/ | 1,000 to 4,999 | 5,000 to 9,999 | 10,000 to 24,999 | 25,000 or more |

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries." 2/ Data for 1982-83 are for companies with fewer than 1,000 employees. 3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

(S) = Data have been withheld because of imputation of more than 50 percent. N/A = Not available KEY:

The number of R&D scientists and engineers per 1,000 employees for 1992 is derived by dividing the arithmetic mean of scientists and engineers employed in January 1991 and January 1992 by the number of employees in all activities in March 1991. Similar procedures were used for earlier years. Nonmanufacturing industries are included in pre-1983 calculations. NOTE:

Table N-18. R&D funds per employee in R&D-performing companies, by size of company: 1982-92

| | | | | | | | | | | Р | age 1 of 1 |
|---|---|---|--|---|---|---|---|---|---|---|---|
| Size of company [Number of employees] | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| | | | | Total (comp | any, Federa | al, and other |) R&D fund: | s per emplo | yee | | |
| Total | \$3,719 1,732 N/A 1,790 1,883 2,469 5,502 | \$4,163 2,186 N/A 2,042 2,194 2,966 5,785 | \$4,579 2,767 2158 2,480 2,505 3,385 6,184 | \$5,148 3,028 2,238 2,725 2,851 3,500 7,071 | \$5,153 5,414 3,229 3,261 2,849 3,334 6,878 | \$5,338 5,553 3,121 3,395 3,210 3,668 7,035 | \$5,678 5,318 2,900 3,232 4,009 3,725 7,547 | \$6,122 5,618 3,157 3,394 4,082 3,522 8,027 | \$6,194 6,056 3,626 3,573 4,204 4,222 8,014 | \$6,842 7,279 (W) 4,243 4,706 5,223 8,252 | \$7,268 7,688 (W) 5,025 4,948 5,619 8,619 |
| | | | | Company a | nd other (ex | cept Federa | al) R&D fund | ls per emplo | oyee | | |
| Total | \$2,534 | \$2,814 | \$3,095 | \$3,383 | \$3,503 | \$3,562 | \$3,804 | \$4,140 | \$4,381 | \$5,322 | \$5,791 |
| Fewer than 500 1/ | 1,381 N/A 1,503 1,551 2,025 3,436 | 1,749 N/A 1,687 1,613 2,351 3,637 | 2,212 1,782 2,096 2,199 2,689 3,792 | 2,407 1,700 2,316 2,409 2,769 4,208 | 4,750 2,997 2,725 2,316 2,697 4,077 | 4,811 2,859 2,799 2,682 2,969 4,010 | 4,686 2,657 2,740 3,309 3,139 4,346 | 4,891 2,968 2,931 3,493 3,095 4,851 | 5,339 3,369 3,133 4,013 3,617 4,917 | 6,242 (W) 3,817 4,228 4,106 5,739 | 6,553 (W) 4,561 4,463 4,435 6,228 |

KEY: N/A = Not available

(W) = Data have been withheld pending further review.

NOTE: Averages were derived by dividing total and company R&D funds for a calendar year by employment data for March of that year.

^{1/} Data for 1982-83 are for companies with fewer than 1,000 employees. 2/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

SURVEY DEFINITIONS

Company (and Other) Funds for R&D

Cost of R&D actually performed within the company and funded by the company itself or by other non-Federal sources via contract, not including the cost of R&D supported by companies but contracted to outside organizations such as research institutions, universities and colleges, nonprofit organizations, or (to avoid double-counting) other companies.

Cost Per R&D Scientist or Engineer

The arithmetic mean of the numbers of full-time equivalent (FTE) scientists and engineers engaged in the performance of R&D reported for January in 2 consecutive years divided into the total R&D expenditures of the earlier year, with the ratio attributed to the earlier year (For example, the mean of the numbers of FTE R&D scientists and engineers in January 1991 and January 1992 is divided into total 1991 R&D expenditures for a total cost per R&D scientist or engineer in 1991.)

Employment, FTE R&D Scientists and Engineers

Persons employed by the company during the January following the survey year who are engaged in

scientific or engineering work at a level that requires knowledge of physical, life, engineering, or mathematical science equivalent at least to that acquired through completion of a 4-year college program with a major in one of those fields. (The statistics in this report show the full-time equivalent (FTE) employment. The FTE is the number of scientists and engineers in the company who are assigned full time to R&D projects plus the number of non-full-time R&D scientists and engineers prorated according to the fraction of their total work time spent on R&D projects.)

Employment, Total

Number of persons domestically employed by R&D-performing companies in all activities during the pay period that includes the 12th of March.

Federally Funded Research and Development Centers (FFRDCs)

R&D-performing organizations administered by industrial, educational, or other institutions on a nonprofit basis, exclusively or substantially financed by the Federal Government (R&D expenditures of the FFRDCs that are industry administered are included with the Federal R&D data of the industry classification of each of the administering firms. The industry-administered FFRDCs included in the 1992 survey are listed below.)

FFRDCs Supported by the Department of Energy:

Bettis Atomic Power Laboratory Westinghouse Electric Corp. West Mifflin, PA

Energy Technology Engineering Center Rockwell International Corp. Canoga Park, CA

Hanford Engineering Development Laboratory Westinghouse-Hanford Corp. Richland, WA

Idaho National Engineering Laboratory EG&G Idaho, Inc.; Westinghouse Electric Corp. Argonne National Laboratory, West; Rockwell International Corp.; Idaho Falls, ID

Knolls Atomic Power Laboratory General Electric Co. Schenectady, NY

Oak Ridge National Laboratory Martin Marietta Energy Systems, Inc. Oak Ridge, TN

Sandia National Laboratories Western Electric Co., Inc.—Sandia Corp. Albuquerque, NM

Savannah River Laboratory Westinghouse Electric Corp. Aiken, SC

FFRDCs Supported by the National Institutes of Health, Department of Health and Human Services:

NCI Frederick Cancer Research Facility Program Resources, Inc. Frederick, MD

Funds for R&D, Federal - receipts for R&D performed by the company under Federal R&D contracts or subcontracts and R&D portions of Federal procurement contracts and subcontracts.

Funds for R&D, total - operating expenses incurred by a company in the conduct of R&D in its own laboratories or other company owned or operated facilities including wages and salaries, materials and supplies, property and other taxes, maintenance and repairs, depreciation, and an appropriate share of overhead, not including capital expenditures.

Net sales and receipts - dollar values for goods sold or services rendered by R&D-performing companies to customers (outside the company), including the Federal Government, less such items as returns, allowances, freight, charges, and excise taxes. (Domestic intracompany transfers and sales by foreign subsidiaries are excluded, but transfers to foreign subsidiaries and export sales to foreign companies are included.)

Research and development - basic and applied research in the sciences and engineering and the design and development of prototypes and processes, excluding quality control, routine product testing, market research, sales promotion, sales service, other nontechnological activities or routine technical services, and research in the social sciences or psychology.

Basic research - original investigations for the advancement of scientific knowledge not having specific immediate commercial objectives, although such investigations may be in fields of present or potential interest to the reporting company.

Applied research - investigations for the discovery of new scientific knowledge having specific commercial objectives with respect to products or processes. (Applied research differs from basic research chiefly in terms of the objectives of the reporting company.)

Development - technical activities not routine in nature concerned with translating research findings or other scientific knowledge into products or processes. (Not included are routine technical services to customers or other activities excluded above.)

SECTION C. SURVEY DOCUMENTS

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| Form RD-1A Instructions | 155 |

NATIONAL SCIENCE FOUNDATION 1800 G STREET, N.W. WASHINGTON, D.C. 20550



FROM THE DIRECTOR NATIONAL SCIENCE FOUNDATION

The National Science Foundation requests your company's participation in its 1992 Survey of Industrial Research and Development. This annual survey is the only source of detailed information on U.S. industry's research and development (R&D) performance.

Your company's participation is vital to the accuracy of the resulting information. Because R&D expenditures are concentrated in relatively few companies, a completed response is needed from each surveyed firm – there is no good substitute for the information that you can provide. Your company can be assured of complete confidentiality. Survey data will be released only in aggregate form so that responses of individual companies cannot be identified.

Survey results will be made available to government and industry officials, researchers, and other interested individuals. If you would like to receive a copy of the final publication or if you have suggestions for improvements, please contact Mr. John Gawalt or Mr. Raymond Wolfe, Division of Science Resources Studies, Room L-609, National Science Foundation, Washington, DC 20550, or by telephone at (202) 634–4673.

Sincerely,

Frederick M. Bernthal Acting Director

Enclosures

RD-1-L1 (2-93)



UNITED STATES DEPARTMENT OF COMMERCE Bureau of the Census Washington, DC 20233-0001

OFFICE OF THE DIRECTOR

FROM THE ACTING DIRECTOR BUREAU OF THE CENSUS

The Bureau of the Census conducts the Survey of Industrial Research and Development under sponsorship of the National Science Foundation. Measures of research and development expenditures by industry are important in analyzing and forecasting long-term economic growth, investigating determinants of productivity, formulating tax policy recommendations, and comparing individual research performance against industry averages.

We are enclosing your report form and a file copy for the Survey of Industrial Research and Development, Report RD-1. To reduce response burden, we alternate between "long" and "short" versions of this report form. We are using the "short" version this year to obtain information for calendar year 1992.

We are also enclosing an instruction manual. Please read it carefully, since it provides guidelines for reporting. You may want to refer to it as you complete your report. We recognize that you may not maintain book records for particular items. In such cases, please use carefully prepared estimates.

The law (Title 13, United States Code) authorizes this report. Items 1A and 1B and Columns 2 and 4 of Item 4C are part of the basic statistical program of the Bureau of the Census for manufacturing companies, and reporting of these items is mandatory. Response to the remainder of the inquiries is voluntary; however, we need your cooperation to make the results of the survey comprehensive and accurate. By Section 9 of the same law (Title 13), your report to the Bureau of the Census is fully confidential. Only sworn Bureau of the Census employees will see the information you report, and they will use it only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

Please return the completed form within 60 days. If you have questions concerning this survey, please direct them to the Special Surveys Branch of our Industry Division on (301) 763–5598. If you need additional copies of the report or additional time, please call (812) 288–3331. We appreciate your past cooperation in this important survey and look forward to your continued participation.

A Sear

Sincerely,

Harry A. Scarr

Enclosures

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INSTRUCTIONS FOR SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1992

OUTLINE OF INSTRUCTIONS

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GENERAL INSTRUCTIONS

Comprehensive and timely information about the nature and support of corporate research and development activities is an important component in the overall assessment of our nation's scientific and technological resources. The information you provide is used to prepare national measures of industrial research and development not available from any other source. By carefully completing this report, the accuracy of this information is ensured.

Estimates are Acceptable – If you cannot answer a question from your company records, please estimate the answer carefully. Direct any questions regarding this form to the Bureau of the Census, ATTN: Industry Division, Washington, DC 20233–0001 or call (301) 763–5598.

Additional Forms – Photocopies of this form are acceptable. If you require additional forms, write to the Bureau of the Census, 1201 East 10th Street, Jeffersonville, IN 47132–0001 or call (812) 288–3331.

Companies Reporting in Survey for the First Time – Companies which did not report in the 1991 survey are asked to provide figures for both 1991 and 1992. If the company had no R&D expenditures, complete only Item 1. Enter "No R&D" in the "Remarks" section, sign, and return the form.

Figures for Earlier Years are Preposted on the Form – If your company reported for 1991, entries from that form have been copied on the present form.

Please describe in the "Remarks" section (page 2 of the form) the reasons for any substantial

increase or decrease in the 1992 figures entered on this form when compared to corresponding 1991 figures. Examples of such reasons are new government contracts, acquisitions and divestitures, revised accounting method, etc. If you acquired or disposed of a unit performing an important amount of research and development during the 2-year period, please identify the unit in "Remarks," and give the total amount of research and development accounted for by such unit.

Revision of Earlier Year Figures – If your company reported for 1991, entries from that form are pre-printed on the current form. Please revise the 1991 figures to be comparable with 1992 data and explain in the "Remarks" section any significant revisions made.

Report for Your Entire Company – Reseach and development activities for your entire domestic company should be reported, including all subsidiaries, divisions, etc. Report sales and employment figures for all parts of the company, even those that do not perform R&D, as long as they are located in the 50 states or the District of Columbia.

Period Covered by the Report – Figures should be reported on a calendar years basis. Fiscal year data, however, are acceptable for all items except for employment, provided your fiscal year ends between September and March. Please report employment figures (items 1B and 3) for the specific time indicated for both of these items.

Geographic Area Covered – The data relate to business firms which operate one or more establishments in one or more of the 50 States or the District of Columbia.

Public reporting burden for this collection of information is estimated to average 5–1/2 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information including suggestions for reducing this burden to Herman G. Fleming, National Science Foundation, 1800 G Street, Washington, DC 20550; and to the Office of Information and Regulatory Affairs, Office of Management and Budget (OMB No. 3145-0027), Washington, DC 20503.

IMPORTANT NOTES

- Financial information Report all financial information in thousands of dollars.
- Employment information Report all employment information in numbers of people.
- Sales and employment (item 1) Report sales and employment information from all domestic subsidiaries, including those that do not perform research and development.
- Costs incurred for R&D (item 4) Include R&D depreciation and overhead in your estimated costs. Exclude R&D capital expenditures.
- Costs incurred for R&D (item 4) Costs incurred for R&D performed outside the 50 States or the District of Columbia or for R&D contracted out to non-company R&D organizations should not be reported in item 4.
 Report R&D performed outside of the United States in item 6.

Section I - General Company Data

Item 1 - Sales and Employment for Company

Item 1A – Net Sales – Report net sales and receipts for this company and its domestic subsidiaries. The reported figures should represent value f.o.b. plant after discounts and exclude freight charges and excise taxes.

Include:

- Sales of products and services to other companies, individuals, U.S. Government agencies, and foreign countries
- · Transfers to foreign subsidiaries

Exclude:

- · Domestic intra-company transfers
- · Sales by foreign subsidiaries

Item 1B - Employment - Report the number of employees of the company in all activities in the 50 States and the District of Columbia during the pay periods which include March 12 of 1991 and 1992. This figure would be the same as item 1 of treasury form 941, if one form 941 was filed for the entire company.

➤ Section II – Research and Development Performed within the Company in the United States

Item 2 – Research and Development Expenditures

Definition of Research and Development –Research and development includes basic research and applied research in the sciences and in engineering, and design and development of prototype products and processes.

For the purposes of this study, research and development includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine, if the purpose of such activity is to do one or more of the following things:

- 1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application.
- Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.
- 3. Apply existing knowledge to problems involved in the improvement of a present product or process.

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of the questions.

Activities to be excluded from R&D -

- Capital expenditures
- · Routine product testing
- · Research in social sciences or psychology
- · Geological and geophysical exploration activities
- · Technical services such as:
 - Quality and quantity control
 - Technical plant sanitation control
 - Trouble-shooting in connection with breakdowns in full-scale production
 - Advertising programs to promote or demonstrate new products or processes
- Assistance in preparation of speeches and publications for persons not engaged in research and development

Item 3 - Research and Development
Scientists and Engineers - Scientists and
engineers are defined for this survey as all
persons engaged in scientific or engineering work
at a level which requires a knowledge of physical
or life sciences, engineering, or mathematics
equivalent to completion of a 4-year college
course with a major in these fields, regardless of
whether or not they actually hold a degree in this

The figures on R&D scientists and engineers will be obtained primarily from two sources:

 For company laboratories performing only research and development, report the number scientists and engineers on the rolls in January.

Item 3 - Research and Development Scientists and Engineers - Continued

2. For companies whose activities are not solely devoted to research and development, report the proportion of total work time of scientists and engineers that is devoted to research and development. For example, if a company had 60 scientists and engineers in January 1993 and one-fourth of their time was charged to R&D projects, the figure for the number of R&D scientists and engineers for this company would be 15.

Item 4 – Costs Incurred for Research and Development Performed within the Company by Major Type and Source of Funds –

Include:

- · Wages, salaries, and related costs
- · Materials and supplies consumed
- · R&D depreciation and overhead
- · Cost of computer software used in R&D activities
- Total charges for work done on contract, including profit
- Utilities, such as telephone, telex, electricity, water, and gas
- · Travel costs and professional dues
- Property taxes and other taxes (except income taxes) incurred on account of the R&D organization or the facilities they use
- Insurance expense
- Maintenance and repair, including maintenance of buildings and grounds
- Company overhead including: personnel, accounting, procurement and inventory, and salaries of research executives not on the payroll of the R&D organization

Exclude.

- R&D performed abroad (See Item 6), such as Canada and Puerto Rico
- Cost of R&D performed by non-company R&D organizations of any kind
- Capital expenditures
- Patent expense
- · Income taxes and interest
- The portion of company-held R&D contracts that were subcontracted outside the reporting company
- Fellowships, grants, and gifts to promote R&D or the study of science and engineering

Types of Research

Item 4A – Basic Research – Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific immediate commercial objectives, (although they may be in the fields of present or potential interest to the reporting company).

Item 4B1 – Applied Research – Include the cost of research projects which represent investigation in discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes.

Item 4B2 – Development – Include the cost of projects which represent technical activity concerned with non-routine problems encountered in translating research findings or other general scientific knowledge into products or process.

Exclude routine technical services to customers or other items excluded from the definitions of total research and development in Item 2.

Type of Activity Included in Development:

- Design and operation of pilot plants and semiwork plants
- Engineering activity required to advance the design of a product or process so it meets specific functional and economic requirements
- Design, construction, and testing of prototypes and models
- · Designs for special manufacturing equipment and tools
- Preparation of reports, drawings, formulas, specifications standard practice instructions, or operating manuals

Type of Activity Excluded from Development

- · Toolmaking and tool tryout
- Production of detailed construction drawings and manufacturing blueprints
- Pre-production planning

Methods of Estimating Research and Development Expenditures by Type – (Basic, Applied, and Development) If your company does not keep records that meet or can be allocated to these specific categories, estimate by:

- 1. Isolating the **projects** that clearly fall in the development category. If your company fabricates products, such development activity will include the design, construction, and testing of prototypes and models. Some defense contracts typically call for several test models. If your company's research and development frequently involves the development of a "process" as in chemicals and petroleum, such development activity would include operations beyond the bench scale, primarily the design and operations of pilot plants or semiworks.
- Isolating the organizational units which have R&D activities that can be readily classified based on the function assigned to the unit. If R&D work is done in production units as well as in various laboratories, it is generally development type.
- Distributing the **balance** on the basis of a review of individual projects or on the basis of other summaries of the work. Please use the definitions for basic, applied, and development given above.

Source of Funds - Federal and Company

Item 4 - Column 2 - Federal Funds

Include:

- Cost of work done on Federal R&D contracts or subcontracts
- R&D portions of procurement contracts or subcontracts

Exclude:

 Federal R&D contracts and R&D portions of procurement contracts that you subcontracted to other R&D organizations (including these would cause duplication in the statistical totals, which include data on work actually performed by each company.

Item 4 - Column 3 - Company and other funds, except Federal

Include:

- All company-sponsored research and development performed within the company
- Performed under contract from non-federal sources

Exclude:

 Company sponsored research performed outside of the company

Item 4E – Company and Other Funds, Except Federal, Budgeted for the Year 1993 – Report the estimated cost of company and other non-federally sponsored R&D that will be performed within the 50 states and the District of Columbia.

Item 5 – Research and Development by Functional Category

Item 5A to 5E – Energy Research and Development – Include all spending for research and development to increase energy resources or capabilities, including the development of energy equipment. Energy research and development can include costs of R&D projects (both product and process) on explorations, extractions, transportation, processing, storage, generation (including conversion), distribution, conservation, etc., of present, new, or improved forms of energy.

If R&D spending is for joint or multiple purposes, estimate and report the portion of cost incurred for the energy purpose. In the limited number of cases where the separation of joint (multiple) costs by type of energy cannot be esitmated, include the total cost of the R&D project when the primary purpose of the project is energy research and development. If the project is not primarily for energy reseach and development then exclude all of the project cost.

Conservation and utilization includes R&D activities undertaken to reduce consumption either at the point of energy use or in the transmission, transportation, storage, or conversion of energy. Examples of such are research and development undertaken primarily to reduce fuel consumption in manufacturing, to improve the efficiency of transportation of energy products, or to produce an end product which is more efficient in energy consumption.

All other energy includes areas such as wind, waste, hydroelectric, etc. Also include in this category the development of energy equipment which cannot adequately be classified in items 5A to 5C.

Item 5F - Pollution Abatement Research and Development - Includes R&D spending for the purpose of reducing or eliminating the emission of pollutants. "Pollution" refers to the emission of pollutants to the outside of a firm's property or activities; "abatement" includes prevention, treatment, or recycling.

Exclude costs:

- To contribute to environmental aesthetics
- To increase equipment durability in corrosive environments
- To conserve energy (include as energy R&D in item 5C)
- To conserve natural resource
- To increase employee comfort, safety, and health.

If the only purpose of the R&D spending is pollution abatement, include the total expenditures on the project. If pollution abatement is only one of several purposes, report only the R&D costs associated with pollution abatement. When the separation of joint costs is not feasible, include the total R&D costs for a project if the purpose is primarily (more the 50 percent) for pollution abatement.

If the project is not primarily for pollution abatement purposes, exclude all of the project costs. Also exclude project costs if expected pollution abatement benefits are obtained at no extra cost.

Section III – Research and Development Performed Outside the Company – (R&D not included in item 4).

Item 6 – Total Company Funds Spent for Research and Development Activities Performed by Foreign Subsidiaries Outside the United States.

Report the amount of research and development financed by the U.S. parent or its foreign subsidiaries and performed by company R&D laboratories, branch plants, or other organizations, located outside the United States. Include R&D funds spent in Canada and Puerto Rico. This item excludes R&D activities performed by foreign subsidiaries which were financed by foreign governments or other outside organizations.

NOTE – Foreign subsidiaries are those outside the 50 States or the District of Columbia.

Item 7 – Status of This Company on December 31, 1992

In the "Remarks" section, specify change or correction, e.g., "wholly-owned subsidiary of ABC Company," "merger with XYZ Company," "acquired by 123 Corporation." Provide date of organizational change.

NOTICE — Your report to the Census Bureau is confidential by law (title 13, U.S. Code). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

The instructions and definitions on this form are not complete. Please read the enclosed instruction sheet before completing this form.

RETURN TO



BUREAU OF THE CENSUS 1201 East 10th Street Jeffersonville, IN 47132-0001

Data supplied in item 1 and in item 3A.3, columns (4) and (6), for 1992 on this form will satisfy the mandatory reporting requirements (Title 13, U.S. Code).

FORM RD-1A

U.S. DEPARTMENT OF COMMERCE

SURVEY OF INDUSTRIAL RESEARCH AND **DEVELOPMENT DURING 1992**

Name and address of company

PLEASE RETURN THIS COPY

Item 1 - SALES AND EMPLOYMENT FOR **COMPANY (Domestic)** A. Include sales of products and services to other companies, individuals, U.S. Government agencies, and foreign countries. Exclude domestic intra-company

B. Total domestic company employment in all activities

transfers, and sales by foreign subsidiaries.

during the pay period which includes the 12th of March 1991 and 1992. (Item 1 of Treasury Form 941, if one Form 941 was filed for the entire company.)

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| Domes | tic employment |
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| 1991 | 1992 |
| Number | Number |
| 111 | 112 |

RESEARCH AND DEVELOPMENT — R&D

Includes basic and applied research in the sciences and in engineering, and design and development of prototype products and processes.

For the purposes of this study, research and development includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine but excluding psychology, if the purpose of such activity is to do one or more of the following things:

1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application.

- 2. Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.
- 3. Apply existing knowledge to problems involved in the improvement of a present product or process.

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of the questions.

See instructions for more detail.

Item 2 - CHECK FOR RESEARCH AND DEVELOPMENT

Mark (X) the appropriate box.

₂₀₁ Company had R&D in 1992 – Complete and return this form.

202 Company had no R&D in 1992, but has in the past and may in the future -Complete form, enter zeros where applicable, and return this form.

₂₀₃ Company does not conduct R&D – Go to item 7, sign and return this form.

| | | 1991 | | | | 1992 | | |
|--|---|--------------------------|--|--|--|--|--|------------------------|
| A. WITHIN THE COMPANY - Costs incurred for research and development performed within the company by major two and course of funds. Should be availabled. | Federal funds | Company and other | Total ((1) + (2)) | (2)) | Federal funds | Company and other | <u>↑</u> | Total ((4) + (5)) |
| from B and C) | Bil. Mil. Thou. Dols. | Bit. Mil. Thou. | Sil. Mil. | Thou. Dols. Bil. | Mil. Thou. Dols. | 3il. Mil. Thou. | 331. | Mil. Thou. Dols. |
| Basic research If "None," please mark (X) → [] | 900 | 305 | \$ 000 | 304 | 000 | 500 | 300 | 000 |
| 2. Applied research and development a. Applied research | 000 | 315 | 313 | 914 | 000 | 315 | 316 000 | 000 |
| | 321 | 322 | 323 | 324 | 000 | | 326 | 000 |
| c. Total (Sum of lines a and b) | | | | 1 6 | | | 1 2 2 2 2 | 000 |
| 3. TOTAL (Sum of 1 and 2c) | | 342 | | m | 08 | | | 000 |
| B. Outside the company – Total company funds for research and development activities financed by the company but performed by others outside the company within the United States (Should be excluded from A3) | | 382 | 000 | | | 955 69 | 000 | |
| C. Foreign – Total company funds for research and development activities performed by foreign subsidiaries or by other organizations outside the United States (Should be excluded from A3) | | | 000 | | | 98e 49 | 000 | |
| D. TOTAL – Company and other funds, except Federal (Sum of A3, B, and C) | | | 000 | | | 33.2 | 000 | |
| Item 4 - COMPANY AND OTHER FUNDS, EXCEPT FEDERAL FOR RESEARCH AND DEV | DERAL FOR RESEARCH AI E YEAR 1993 | ND DEVELOPMENT PERFORMED | ЗМЕ D | | | Bil. Mil. Thou. C | Dols. | |
| (Comparable to the 1992 figure reported in ITEM 3A.3, column 5) | umn 5) | | | | * | | 000 | |
| Item 5 - NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS - All persons engaged in scientific or engineering work at a levele which requires a knowledge of physical or life sciences, engineering, or mathematics equivalent to completion of a 4-year college course with a major in these fields, regardless of whether or not they actually hold a degree in this field. See instructions for more detail. | IT SCIENTISTS AND resting work at a level which ring, or mathematics equivalenese rese fields, regardless of whe | nn ther | Report the full-tin development scie January 1992 and devoted to resean | Report the full-time equivalent numbe development scientists and engineers banany 1993. Prop devoted to research and development | Report the full-time equivalent number of research and development scientists and engineers on the rolls in abanany 1993. Proportion total time devoted to research and development. | January 1992 Number | 205 | January 1993 Number |
| Item 6A - OPERATIONAL STATUS Item 6B - I | Item 6B - NEW OWNER OR OPERATOR Name | OR | Item 7 - CERT | IFICATION - This | s report is substantially ac | - CERTIFICATION - This report is substantially accurate and has been prepared in accordance with instructions. | red in accordan | ce with instructions. |
| 1992? Day | | | Name of person 1 | Name of person to contact regarding this report | ng this report | | Telephone number Area code Number | iber Extension |
| □ No | | 805 State 806 ZIP Code | Signature of authorized official | norized official | | Title | | 701 Date |
| FORM RD-1A (4.22-93) | | | | | | | | |

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INSTRUCTIONS AND DEFINITIONS FOR SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1992 FORM RD-1A

GENERAL INSTRUCTIONS

Comprehensive and timely information about the nature and support of corporate research and development activities is an important component in the overall assessment of our nation's scientific and technological resources. The information you provide is used to prepare national measures of industrial research and development not available from any other source. By carefully completing this report, the accuracy of this information is ensured.

Estimates are acceptable – If you cannot answer a question from your company records, please estimate the answer carefully.

Report all value figures in thousands of dollars.

Example: 1,123,678,599 dollars.

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Report

If you estimate your answers in millions of dollars, please fill the thousands box with zeros.

Example: 1,124 million dollars.

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| \$ 1 | 1 | 124 | I | 000 | 000 |

Report

Enter "0" where appropriate rather than leaving blank spaces.

If you have questions regarding reporting problems on this form, please write to the Bureau of the Census, Industry Division Washington, DC 20233 or call (301) 763–5598.

Additional forms – Photocopies of this form are acceptable. If you require additional forms, write to the Bureau of the Census, 1201 East 10th Street, Jeffersonville, IN 47132–0001 or call (812) 288–3331.

Report for your entire company – Research and development activities for your entire domestic company should be reported, including all divisions, etc. Report sales and employment figures for all parts of the company, even those that do not perform R&D, as long as they are located in the 50 States or the District of Columbia.

Period covered by the report – Figures should be reported on a calendar year basis. Fiscal year data, however, are acceptable for all items except for employment, provided your fiscal year ends between September and March. Please report employment figures (Item 1B and 3) for the specific time indicated for both of these items.

Geographic area covered – The data relate to business firms which operate one or more establishments in one or more of the 50 States or the District of Columbia.

The data are intended to relate to business firms in the fields of manufacturing, minerals, and other economic areas.

Please complete and return this form in the envelope provided within 60 days. Please make a copy for your records.

This report should cover your entire domestic company, including all subsidiaries and affiliates, unless otherwise designated.

Public reporting burden for this collection of information is estimated to average 1 hour per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimates or any other aspects of this collection of information including suggestions for reducing this burden to Herman G. Fleming, National Science Foundation, 1800 G. Street, Washington, DC 20550; and to the Office of Information and Regulatory Affairs, Office of Management and Budget (OMB No. 3145–0027), Washington, DC 20503.

DEFINITIONS

Research and development – Research and development includes basic research and applied research in the sciences and in engineering, and design and development of prototype products and processes.

For the purpose of this study, research and development includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine but excluding psychology, if the purpose of such activity is to do one or more of the following things:

- 1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application.
- Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.
- Apply existing knowledge to problems involved in the improvement of a present product or process.

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of the questions.

Activities to be excluded from R&D -

- Capital expenditures
- · Routine product testing
- · Research in social sciences or psychology
- Geological and geophysical exploration activities
- · Technical services such as:
 - · Quality and quantity control
 - · Technical plant sanitation control
 - Trouble-shooting in connection with breakdowns in full-scale production
 - Advertising programs to promote or demonstrate new products or processes
 - Assistance in preparation of speeches and publications for persons not engaged in research and development

Research and development scientists and engineers

Scientists and engineers are defined for this survey as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences, engineering, or mathematics equivalent to completion of a 4-year college course with a major in these fields, regardless of whether or not they actually hold a degree in this field.

This figure on R&D scientists and engineers will be obtained primarily from two sources:

- For company laboratories performing only research and development, report the number of scientists and engineers on the rolls in January.
- 2. For companies whose activities are not solely devoted to research and development, report the proportion of total work time of scientists and engineers that is devoted to research and development. For example, if a company had 60 scientists and engineers in January 1993 and one-fourth of their time was charged to R&D projects, the figure for the number of scientists and engineers for this company would be 15.

SPECIFIC INSTRUCTIONS

Item 1 - SALES AND EMPLOYMENT FOR COMPANY (Domestic)

Item 1a – DOMESTIC NET SALES AND RECEIPTS – Report net sales and receipts for this company and its domestic subsidiaries. The reported figures should represent value f.o.b. plant after discounts and exclude freight charges and excise taxes.

Include:

- Sales of products and services to other companies, individuals, U.S. Government agencies, and foreign countries
- Transfers to foreign subsidiaries

Exclude:

- · Domestic intra-company transfers
- · Sales by foreign subsidiaries

Item 1B – DOMESTIC EMPLOYMENT – Report the number of employees of the company in all activities in the 50 States and the District of Columbia during the pay periods which include March 12 of 1991 and 1992. This figure would be the same as Item 1 of Treasury Form 941, if one Form 941 was filed for the entire company.

Item 2 – CHECK FOR RESEARCH AND DEVELOPMENT – Check the appropriate box that best describes the R&D activities of your company.

Item 3 - REPORT COSTS INCURRED FOR RESEARCH AND DEVELOPMENT BY MAJOR TYPE AND SOURCE OF FUNDS -

Include:

- Wages, salaries, and related costs
- Materials and supplies consumed.
- R&D depreciation and overhead
- Cost of computer software used in R&D activities
- Total charges for work done on contract, including profit
- Utilities, such as telephone, telex, electricity, water, and gas
- Travel costs and professional dues
- Property taxes and other taxes (except income taxes) incurred on account of the R&D organization or the facilities they use

- Insurance expense
- Maintenance and repair, including maintenance of buildings and grounds
- Company overhead including: personnel, accounting, procurement and inventory, and salaries of research executives not on the payroll of the R&D organization

Exclude:

- R&D performed abroad (see ITEM 3.C.), such as in Canada and Puerto Rico
- Cost of R&D performed by non-company R&D organizations of any kind
- · Capital expenditures
- Patent expenses
- · Income taxes and interest
- The portion of company-held R&D contracts that were subcontracted outside the reporting company
- Fellowships, grants, and gifts to promote R&D or the study of science and engineering

Item 3.A - REPORT COST INCURRED FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY

Types of Research

Item 3.A.1 – BASIC RESEARCH – Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific immediate commercial objectives (although they may be in the fields of present or potential interest to the reporting company).

Item 3.A.2.a – APPLIED RESEARCH – Includes the cost of research projects which represent investigation in discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes.

Item 3.A.2.b - DEVELOPMENT - Include the cost of projects which represent technical activity concerned with non-routine problems encountered in translating research findings or other general scientific knowledge into products or process.

Exclude routine technical services to customers or other items excluded from the definition of total research and development.

Types of activities included in development

- Design and operation of pilot plants and semiwork plants
- Engineering activity required to advance the design of a product or process so it meets specific functional and economic requirements
- Design, construction, and testing of prototypes and models
- Designs for special manufacturing equipment and tools
- Preparation of reports, drawings, formulas, specifications standard practice instructions, or operating manuals

Types of activities excluded from development

- Toolmaking and tool tryout
- Production of detailed construction drawings and manufacturing blueprints
- · Pre-production planning

Methods of estimating research and development expenditures by type (basic, applied, and development) – If your company does not keep records that meet or can be allocated to these specific categories, estimate by:

- 1. Isolating the projects that clearly fall in the development category. If your company fabricates products, such development activity will include the design, construction, and testing of prototypes and models. Some defense contracts typically call for several test models. If your company's research and development frequently involves the development of a "process" as in chemicals and petroleum, such development activity would include operations beyond the bench scale, primarily the design and operations of pilot plants or semiworks.
- Isolating the organizational units which have R&D activities that can be readily classified based on the function assigned to the unit. If R&D work is done in production units as well as in various laboratories, it is generally development type.
- 3. Distributing the balance on the basis of individual projects or on the basis of other summaries of the work. Please use the definitions for basic, applied, and development given above.

Item 3.A.2.c - TOTAL APPLIED RESEARCH AND DEVELOPMENT - Add line 3.A.2.a and line 3.A.2.b.

Item 3.A.3 - TOTAL WITHIN COMPANY (BASIC RESEARCH AND APPLIED RESEARCH AND DEVELOPMENT) - Add line 3.A.1 and line 3.A.2.c.

Item 3.B - TOTAL COMPANY FUNDS FOR RESEARCH AND DEVELOPMENT ACTIVITIES FINANCED BY THE COMPANY BUT PERFORMED BY OTHERS OUTSIDE THE COMPANY WITHIN THE UNITED STATES -

Includes payments for research and development activities in the form of contracts, grants, fellowships, etc., made to other industrial firms, commercial laboratories, consultants, educational institutions, hospitals, and research institutions, etc.

Exclude:

 Subcontracting of R&D contracts received from the Federal Government or other companies

Item 3.C - TOTAL COMPANY FUNDS FOR RESEARCH AND DEVELOPMENT ACTIVITIES PERFORMED BY FOREIGN SUBSIDIARIES OR BY OTHER ORGANIZATIONS OUTSIDE THE UNITED STATES - Report the amount of research and development financed by the U.S. parent or its foreign subsidiaries and performed by company R&D laboratories, branch plants, or other organizations, located outside the United States.

Include:

· R&D funds spent in Canada and Puerto Rico

Exclude:

 R&D activities performed by foreign subsidiaries which were financed by foreign governments or other outside organizations

NOTE – Foreign subsidiaries are those outside the 50 States or the District of Columbia.

Item 3.D – TOTAL – Company and other funds, except Federal. Add Items 3.A.3, 3.B, and 3.C.

SOURCE OF FUNDS

Item 3 - FEDERAL FUNDS (Columns 1 and 4)

Include:

- Cost or work done on Federal R&D contracts or subcontracts
- R&D portions of procurement contracts or subcontracts

Exclude:

Federal R&D contracts and R&D portions of procurement contracts that you subcontracted to other R&D organizations (including these would cause duplication in the statistical totals, which include data on work actually performed by each company).

Item 3 – COMPANY AND OTHER FUNDS (columns 2 and 5)

Include:

- All company-sponsored research and development performed within the company
- R&D performed under contract from non-federal sources

Exclude:

 Company sponsored research performed outside of the company

Item 4 – COMPANY AND OTHER FUNDS, EXCEPT FEDERAL, FOR R&D PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1993 – Report the estimated cost of company and other non-federally sponsored R&D that will be performed within the 50 States and the District of Columbia. This item is comparable to the 1992 figure reported in Item 3.A.3, column 5.

Item 5 – NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS – Scientists and engineers are defined for this survey as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences or engineering or mathematics equivalent to completion of a 4-year college course with a major in these fields, regardless of whether or not they actually hold a degree in this field.

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Item 6A – OPERATIONAL STATUS – Indicate if this company was owned or controlled by another company on December 31, 1992.

Item 6B – Report the date the company was acquired and the new owner's name and address.

Item 7 - CERTIFICATION - Report the name and telephone number of the person to contact regarding this report.

NATIONAL SCIENCE FOUNDATION

ARLINGTON, VA 22230

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PENALTY FOR PRIVATE USE \$300

RETURN THIS COVER SHEET TO ROOM P35 IF YOU DO NOT WISH TO RECEIVE THIS MATERIAL _ _ , OR IF CHANGE OF ADDRESS IS NEEDED _ _ , INDICATE CHANGE INCLUDING ZIP CODE ON THE LABEL (DO NOT REMOVE LABEL).

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